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54TH CONGRESS, 1st Session. } SENATE. { REPORT No. 1049.

IN THE SENATE OF THE UNITED STATES.

MAY 26, 1896.—Ordered to be printed.

Mr. GALLINGER, from the Committee on the District of Columbia, submitted the following

REPORT:

[To accompany S. 1552.]

The Committee on the District of Columbia, to whom was referred the bill (S. 1552) for the further prevention of cruelty to animals in the District of Columbia, have examined the same and beg leave to report:

The bill is designed to supervise and restrict, not to prohibit, vivisection in this District. That its true purpose and meaning may be understood, the text of the bill, introduced by Senator McMillan and referred to your committee is given, as follows:

A BILL for the further prevention of cruelty to animals in the District of Columbia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter no person shall perform on a living animal any experiment calculated to give pain to such animal, except subject to the restrictions hereinafter prescribed. Any person performing, or taking part in performing, any experiment calculated to give pain, in contravention of this act, shall be guilty of an offense against this act, and shall, if it be the first offense, be liable to a penalty not exceeding one hundred and fifty dollars, and if it be the second or any subsequent offense, shall be liable, at the discretion of the court by which he is tried, to a penalty not exceeding three hundred dollars, or to imprisonment for a period not exceeding six months.

SEC. 2. That the following restrictions are imposed by this act with respect to the performance on any living animal of an experiment calculated to give pain to such animal; that is to say:

(*a*) The experiment must be performed with a view to the advancement by new discovery of physiological knowledge, or of knowledge which will be useful for saving or prolonging life or alleviating suffering; and

(*b*) The experiment must be performed by a person holding such license from the Commissioners of the District of Columbia as is in this act mentioned; and

(*c*) The animal must, during the whole of the experiment, be completely under the influence of ether or chloroform to prevent the animal feeling pain; and

(*d*) The animal must, if the pain is likely to continue after the effect of the anæsthetic has ceased, or if any serious injury has been inflicted on the animal, be killed before it recovers from the influence of the anæsthetic which has been administered; and

(*e*) No experiment shall be made upon any living creature, calculated to give pain to such creature, in any of the public schools of the District of Columbia; provided as follows, that is to say:

First. Experiments may be performed under the foregoing provisions as to the use of anæsthetics by a person giving illustrations of lectures in medical schools, hospitals, or colleges, or elsewhere, on such certificate being given as in this act hereafter mentioned, that the proposed experiments are absolutely necessary for the due instruction of the persons to whom such lectures are given, with a view to their

acquiring physiological knowledge or knowledge which will be useful to them for saving or prolonging life or alleviating suffering;

Second. The substance known as urari or curare shall not, for the purposes of this act, be deemed to be an anæsthetic; and

Third. Notwithstanding anything in this act contained, no experiment calculated to give pain shall be performed on a dog or cat, except upon such certificate being given as in this act mentioned, stating, in addition to the statements hereinbefore required to be made in such certificate, that for reasons specified in the certificate the object of the experiment will be necessarily frustrated unless it is performed on an animal similar in constitution and habits to a cat or dog, and no other animal is available for such experiment; and an experiment calculated to give pain shall not be performed on any horse, ass, or mule, except on such certificate being given as in this act mentioned, that the object of the experiment will be necessarily frustrated unless it is performed on a horse, ass, or mule, and that no other animal is available for such purpose; and

Fourth. Any exhibition to the general public, whether admission be on payment of money or gratuitous, of experiments on living animals, calculated to give pain, shall be illegal.

Any person performing or aiding in performing such experiment shall be deemed to be guilty of an offense against this act, and shall, if it be the first offense, be liable to a penalty not exceeding one hundred and fifty dollars, and if it be the second or any subsequent offense, shall be liable, at the discretion of the court by which he is tried, to a penalty not exceeding three hundred dollars or to imprisonment not exceeding six months; and any person publishing any notice of any such intended exhibition by advertisement in a newspaper, placard, or otherwise, shall be liable to a penalty not exceeding ten dollars.

A person punished for an offense under this section shall not for the same offense be punishable under any other section of this act.

SEC. 3. That the Commissioners of the District may insert, as a condition of granting any license, a provision in such license that the place in which any such experiment is to be performed by the licensee is to be registered in such manner as the said Commissioners may from time to time by any general or special order direct: *Provided*, That every place for the performance of experiments for the purpose of instruction shall be approved by the said Commissioners, and shall be registered in such manner as the said Commissioners may from time to time by any general or special order direct.

SEC. 4. That the Commissioners of the District, upon application as hereinafter prescribed, may license any person whom they may think qualified to hold a license to perform experiments under this act. A license granted by them may be for such time as they may think fit, and may be revoked by them on their being satisfied that such license ought to be revoked. There may be annexed to such license any condition which the said Commissioners may think expedient for the purpose of better carrying into effect the objects of this act, but not inconsistent with the provisions thereof.

SEC. 5. That the Commissioners of the District may direct any person performing experiments under this act from time to time to make reports to them of the result of such experiments, in such form and with such details as the said Commissioners may require.

SEC. 6. That the Commissioners of the District shall cause all registered places to be from time to time visited by inspectors without previous notice, for the purpose of securing compliance with the provisions of this Act, and shall appoint and authorize an agent of the Washington Humane Society to make such inspection, and may also appoint such special inspectors as they may think fit, either permanently or temporarily, who may be willing to act as such inspectors gratuitously.

SEC. 7. That any application for a license under this act, and for a certificate to be given as in this act mentioned, must be signed by three physicians duly licensed to practice and actually engaged in practicing medicine in the District of Columbia, and also by a professor of physiology, medicine, anatomy, medical jurisprudence, materia medica, or surgery in the medical department of any duly established and reliable school or college in the District of Columbia: *Provided*, That when any person applying for a certificate under this act is himself one of the persons authorized to sign such certificate, the signature of some other of such persons shall be substituted for the signature of the applicant.

A certificate under this section may be given for such time or for such series of experiments as the person signing the certificate may think expedient.

A copy of any certificate under this section shall be forwarded by the applicant to the Commissioners of the District, but shall not be available until one week after a copy has been so forwarded.

The Commissioners of the District may at any time disallow or suspend any certificate given under this section.

SEC. 8. That the powers conferred by this act of granting a license or giving a

certificate for the performance of an experiment on living animals may be exercised by an order in writing, under the hand of any judge of a court of record having criminal jurisdiction in the District, in a case where such judge is satisfied that it is essential for the purposes of justice in a criminal case to make such experiment.

This bill was referred by the committee to the Commissioners of the District of Columbia for their opinion. The Commissioners ordered a public hearing on the subject, after which they appointed a committee, consisting of Surg-Gen. George M. Sternberg, United States Army, Dr. William C. Woodward, health officer of the District, and Mr. Henry B. F. Macfarland, to consider the bill and report what modifications, if any, were desirable.

This committee could not agree, as the medical men insisted that no legislation whatever was needed, while Mr. Macfarland endeavored to carry out the intention of the Commissioners. The result was that Drs. Sternberg and Woodward submitted protests against the proposed legislation, while Mr. Macfarland advised the enactment into law of the modified bill, which your committee have unanimously agreed to report, and which was prepared to meet the objections which had been raised to particular provisions of the original bill.

It is proper to say at the outset that there is a sharp difference of opinion among medical men as to the value of vivisection.

The ultra scientists assume to find in it the key to the great mystery of life, and loudly proclaim that the discoveries already made warrant the claim that human suffering is to be mitigated and human life greatly prolonged through the instrumentality of torture and experimentation upon the lower animals. On the other hand, multitudes of educated, humane physicians, who have learned by patient research and large experience the value of other methods to secure the same results, deny that any real advances have been made in medical knowledge in the laboratory of the biologist, while at the same time they deprecate and denounce the cruelties inflicted upon dumb animals by vivisectionists.

It was claimed before your committee that surgery of the abdomen has been brought to its present high standard through vivisection, and yet it is a fact that Dr. Lawson Tait, the greatest ovariotomist in the world, is on record as saying that "Instead of vivisection having in any way advanced abdominal surgery, it has, on the contrary, retarded it." It is also claimed that through vivisection the so-called antitoxin serum was discovered, and that through its use the mortality from diphtheria has been greatly reduced. On the other hand, many of the most eminent physicians affirm that the chief value that antitoxin possesses is the *commercial* value to those who deal in it, and that it is not yet demonstrated that it has any special curative value in the treatment of true diphtheria.

It is pointed out that one writer on the subject, who asserts that since the introduction of antitoxin a much larger proportion of cases of diphtheria recover than formerly, gives away his argument by saying that—

> It was not long after the discovery of the specific infecting agent of diphtheria that it became a matter of almost daily occurrence to find this bacillus in throats whose clinical appearance was not that of diphtheria, and further its absence was noted in cases that presented the typical pseudo-membrane. The former class showed us beyond a doubt that mild cases of diphtheria are common, and probably have not been recognized as such in the past. * * * These cases should always be isolated.

It needs no argument to prove that if the old-fashioned sore throat and follicular tonsilitis are to be called diphtheria, the proportion of cures, whether with antitoxin or the other remedies so well known to the profession, will be much greater than formerly. The opponents of

antitoxin quote such men as Dr. Joseph Winters, of the Willard Parker Hospital of New York, who has had very large experience in this matter, and who has declared:

Some months ago I hoped and expressed, in company with the rest of my associates here, that a specific for the toxin of diphtheria had at last been discovered. My experience of the three months, a personal experience, dealing with 150 cases at the hospital, has been a sad—an extremely sad—disappointment. I am here as the result of that experience, and I regret extremely to say it, to oppose the antitoxin treatment of diphtheria. I have watched for three months and say that *not a single case of septic diphtheria has shown one sign of improvement under antitoxin treatment.*

Dr. Winters then called attention to the fact already cited, that sore throats and tonsilitis are being called diphtheria, and added:

A man was brought in; he had a slight tonsilitis; he received antitoxin; he's on the list. Almost every case examined bacteriologically comes back to the hospital from the board of health as diphtheria.

Then, so says the report, Dr. Winters described in detail the unfavorable results of antitoxin as they had come under his observation—the great rise in temperature, the unnatural position of the head, and the agonizing pains in the joints. He instanced several death-bed scenes in a dramatic way, and the doctors listened with rapt attention. On the 21st day of the present month Dr. Winters read another paper on the subject before the New York Academy of Medicine, in which he attacked the use of the serum either to cure or prevent the disease. He began his address by saying that antitoxin had been given to the world as a specific for diphtheria, and that it had failed to meet expectations. In many cases it had affected the patients in exactly the opposite way, and had caused cardiac troubles that had led to death. It acts on the nervous system, causing paralysis, and affects other organs of the body.

Scores of other eminent physicians could be quoted who hold the same views, thus conclusively demonstrating that the claims of vivisectionists that they are entitled to the credit of this wonderful discovery (?) will have more force after it has been shown that antitoxin is of any real value. The writer of this report, who modestly claims to possess a slight degree of medical knowledge, and who indulges the hope that this remedy for diphtheria may yet be found to be one of genuine merit, and that through its use the ravages of this dread disease may be greatly lessened, has carefully investigated the subject and is convinced that antitoxin is still on trial, a view concurred in even by many medical men who believe that its value in the treatment of diphtheria will ultimately be proved and accepted, but who naturally are rather skeptical in view of the fate that befel Koch's lymph, Brown-Sequard's Elixir of Life, and many other widely heralded medical fads.

More space has been given to this phase of the question than may seem necessary, but inasmuch as the average vivisectionist starts out with the assertion that the opponents of vivisection propose to limit scientific investigations that have resulted in such wonderful discoveries as that of antitoxin, it is certainly proper to state both sides of that interesting question. And it may be added in this connection that the alarming stories about hydrophobia that the disciples of Pasteur (vivisectionists) relate have, in the opinion of a considerable part of the medical profession, little if any foundation in fact. Hydrophobia is a disease so rare that many physicians in large practice for a quarter of a century and more have never seen a case, and yet the Pasteur Institutes are crowded with people bitten by dogs entirely free from rabies, and so-called science (?) encourages the delusion.

One of the most instructive addresses ever delivered on the subject

of vivisection was by the distinguished Professor Theophilus Parvin, of Jefferson Medical College, Philadelphia, before the American Academy of Medicine, of this city, May 4, 1891. This distinguished scientist refused his assent to every claim set up by vivisectionists that scientific knowledge could only be made certain through experiments on the lower animals. He described a class of vivisectionists—

> Who seem seeking useless knowledge, to be blind to the writhing agony and deaf to the cry of pain of their victims, and who have been guilty of the most damnable cruelties without the denunciation by the public and the profession that their wickedness deserves and demands. These criminals are not confined to Germany or France, to England or Italy, but may be found in our own country.

He argued that vivisection should be restricted by law, "and in every case, so far as possible, the animal during and subsequent to the operation must be preserved from pain." In discussing Koch's alleged cure for tuberculosis and Pasteur's preventive inoculations for hydrophobia, this noted physician ventured the prediction that—

> It is not beyond the bounds of possibility that before many years the average results from antihydrophobic and antituberculous inoculations will be of such an unfavorable character that they will give one of the strongest arguments against vivisection.

This was spoken in 1891, and it is instructive to recall the fact that the "antituberculous inoculations" of Koch, over which the medical profession literally lost its head, were long ago relegated to the tomb of forgotten things. Just how soon other of the great triumphs of vivisection will share the same fate time alone can tell.

Turning aside from the technical discussion of the question, it will be instructive to try to ascertain what vivisection really is, and what both the advocates and the opponents of the practice affirm in regard to it. As an appendix to this report will be printed an elaborate hearing before a subcommittee of this committee, held on the 17th day of April last, in which both sides of the question were argued by learned and able men. It is proper to say that the advocates of vivisection were permitted to add to the report a large amount of material not submitted at the hearing, and to some extent the same privilege was accorded to the friends of the bill.

It will be observed that the bill is restrictive, not prohibitive, and yet the memorial adopted by the Medical Society of the District of Columbia starts out with the misleading statement that "an effort is being made by certain citizens of this District to secure the passage of a bill to *prevent* experiments upon living animals." What wonder is it that the same memorial characterizes the writings of antivivisectionists as "sensational nonsense," and intimates that the quotations from the writings of certain physicians who oppose vivisection are "garbled." This is neither argument nor fair controversy. The lines are clearly drawn between those who believe in the unrestricted torture of the brute creation, and those who would, so far as possible, protect the horse, the dog, and the cat from barbarities the mere mention of which makes the blood curdle in the veins of every man and woman who is unwilling to make a sacrifice of human sympathy and human tenderness on the altar of so-called scientific investigation.

Probably no bill was ever presented to Congress which received the indorsement of so distinguished a list of men and women as this one. The city was not canvassed thoroughly, but in two days the names of several hundred men and women were secured, representing the leaders in every department of human activity in this great capital. Among the names are to be found the following, who seem to have

been strongly influenced by the "sensational nonsense" of the anti-vivisectionists:

Justices John M. Harlan, H. B. Brown, David J. Brewer, E. D. White, R. W. Peckham, and George Shiras, jr., of the Supreme Court of the United States; Justices Walter S. Cox, A. B. Hagner, and C. C. Cole, of the supreme court of the District of Columbia.

Chief Justice W. A. Richardson and Justices C. C. Nott and Lawrence Weldon, of the United States Court of Claims.

Bishop John J. Keane, rector of the Catholic University of America; Bishop Henry Y. Satterlee, Bishop John F. Hurst, Archdeacon Thomas S. Childs, Rev. Dr. Alexander Mackay-Smith, rector of St. John's; Rev. Dr. Randolph H. McKim, rector of Epiphany; Rev. Dr. John H. Elliott, rector of the Ascension; Rev Dr. J. A. Aspinwall, rector St. Thomas's Church; Rev. Dr. Tennis S. Hamlin, pastor Church of the Covenant; Rev. Dr. Byron Sunderland, pastor First Presbyterian Church; Rev. Thomas C. Easton, pastor Eastern Presbyterian Church; Rev. Dr. Frederick D. Power, pastor Vermont Avenue Christian Church; Rev. Dr. Oliver A. Brown, pastor Foundry M. E. Church; Rev. Dr. Frank Sewall, pastor New Church; Rev. Dr. J. G. Butler, pastor Memorial Church; Rev. Dr. Alexander Kent, pastor People's Church.

Gen. and Mrs. Nelson A. Miles, Mrs. U. S. Grant, Mrs. George Hearst, Mrs. John Davis, Mrs. A. W. Greely, Mrs. L. Z. Leiter, Mrs. Madeleine Vinton Dahlgren, Mrs. W. M. Stewart, Mrs. S. Powhatan Carter, Mrs. Florence Murray, Mrs. Robert Anderson, Mrs. George Shiras, jr., Mrs. H. B. Brown, Miss Emma Morton, Mrs. Henry M. Teller, Miss Oliver Risley Seward, Mr. and Mrs. A. L. Barber, Mr. and Mrs. Henry F. Blount, Mr. and Mrs. Henry B. F. Macfarland, Mrs. Benaiah L. Whitman, Gen. and Mrs. Rufus Saxton, Gen. John G. Parke, Gen. D. S. Stanley, Gen. J. S. Fullerton, Gen. H. V. Boynton, Gen. James H. Watmough, ex-Senator Charles F. Manderson, ex-Senator John B. Henderson, Representative Charles L. Henry, ex-Justice Andrew Wylie, ex-Commissioner John W. Douglass, Mr. Crosby S. Noyes, Mr. Theodore W. Noyes, Mr. S. H. Kauffmann, Mr. John R. McLean, Mr. John Joy Edson, Mr. B. H. Warner, Mr. Charles J. Bell, Mr. Samuel M. Bryan, Mr. James E. Fitch, Mr. John B. Wight, Comptroller James H. Eckels, Mr. R. Ross Perry, Mr. Enoch Totten, Mr. W. D. Davidge, Mr. Jere M. Wilson, Mr. Mahlon Ashford, Mr. Nathaniel Wilson, Mr. Anthony Pollok, Mr. Calderon Carlisle, Mr. J. Hubley Ashton, Mr. J. C. Heald, Mr. Halbert E. Paine, Mr. Reginald Fendall, Mr. Benjamin Butterworth, Mr. Samuel Maddox, Mr. J. J. Darlington, Mr. A. G. Riddle, Mr. Henry E. Davis, Mr. Chapin Brown, Mr. H. Randall Webb, Mr. John Sidney Webb, Mr. William A. Gordon, Mr. J. Holdsworth Gordon, Mr. William Henry Dennis, Mr. W. Redin Woodward, Mr. Leigh Robinson, Mr. R. E. Lee, jr., Mr. Montgomery Blair, Mr. Frank T. Browning, Mr. William Stone Abert, Mr. Story B. Ladd, Judge Thomas F. Miller, Mr. Crammond Kennedy, Mr. John Cassels, Mr. and Mrs. Charles M. Ffoulke, Mr. and Mrs. Horace S. Cummings, Mr. W. M. Poindexter, Mr. Maxwell Woodhull, Elliott Coues, A. M., M. D., etc., late professor of anatomy, National Medical College; Dr. F. A. Gardner, Dr. S. S. Stearns, Dr. James A. Freer, Dr. Reginald Munson, Dr. L. E. Rauterberg, Dr. S. I. Groot, Dr. Leigh Yerkes Baker, Dr. Waterman F. Corey, Dr. Charles B. Gilbert, Mr. A. S. Pratt, Mr. William D. Cabell, Maj. R. H. Montgomery, U. S. A.; Maj. Frank G. Smith, U. S. A.; Maj. Robert Craig, U. S. A.; James A. Bates, U. S. A.; David A. Irwin, U. S. A.; Theodore Mosher, U. S. A.; Mr. and Mrs. Francis E. Leupp,

Mrs. Albert T. Salter, Frances B. de Krafft, Mr. and Mrs. William D. Windom, Mr. E. A. Carman, Mr. Seaton Perry, Messrs. Harris and Shafer, Mr. James Lansburgh, Mr. Charles W. Needham, Mr. John B. Cotton, Mr. F. W. Pratt, Mr. and Mrs. Charles A. Boynton, Mr. Andrew Langdon, Mr. Robert I. Fleming, Mr. John Tweedale, Miss Ruth G. D. Havens, Mrs. Clara Bewick Colby, Mr. August Burgdorf, Mr. and Mrs. J. Walter Fewkes, Mr. A. G. Heaton, Mr. Charles S. Bradley, Mr. William Ballantyne.

It is to be regretted that the limits of a committee report will not admit of the introduction of a mass of instructive material on hand bearing on this subject. It would be interesting to cite the thousands of names of leading physicians, clergymen, educators, and others who have unsparingly denounced some of the practices of vivisectionists. It warms the heart to know that men like Chief Justice Coleridge, Dr. Morgan Dix, Dr. Phillips Brooks, Alfred Tennyson, Robert Browning, John G. Whittier, and a host of other distinguished clergymen and humanitarians, living and dead, have given the weight of their words and influence against the practice; and it is also instructive to know that out of 1,239 replies from physicians in New York and Massachusetts to an inquiry made by the American Humane Association in 1895 28 were evasive, 243 were in favor of unlimited vivisection, and 968 were against it. This would seem to effectually dispose of the charge so freely made that those who advocate the proposed legislation are sentimentalists and sensationalists, and that they are striking a blow at medical freedom and scientific progress.

The very essence of the protest against the cruel practices of some vivisectionists is found in the utterance of Rev. Dr. Dix in a letter to Philip G. Peabody, esq., of Boston, as follows:

> I have read accounts of the tortures inflicted in the name of science on the creatures committed to our care or placed in our power by a Divine Providence, and they have made me sick at heart for weeks together. I shall never peruse these frightful statistics again. I have also read what arguments are made in extenuation or recommendation of the practice, and their only effect has been to strengthen my conviction that man is capable of becoming the most barbarous and most merciless of all agents.
>
> I gladly join with anyone who protests against the abuse of our power over confiding and intelligent animals.
>
> The lower creation is a deep mystery. There are in it intelligent and sensitive beings with virtues which man may well imitate, and with qualities which inspire affection. God has given us dominion over them and powers which we ought not to abuse; and when I go into His presence I wish to be able to tell Him that I abhor, detest, and protest against the tortures of these poor creatures under the pretense of thereby benefiting our own lordly race.
>
> You may make what use you please of this letter.

The opponents of the proposed legislation broadly affirm that it is uncalled for, unnecessary and mischievous. They claim that the requirements of the bill are already complied with, and at the same time argue that its enactment into law will interfere with if not entirely stop further scientific researches. It is difficult to grasp this reasoning, for if the bill contemplates only what is now in practice, no harm can possibly come from the law. It is also claimed by the medical officials who directly represent the Government that Congress has no right to place them under the supervision of inspectors to be appointed by the Commissioners of the District of Columbia. While it is not conceded that any Department is beyond the power of Congress to regulate it as Congress may see fit, yet to obviate this objection the bill has been so changed as to place the appointing power in the hands of the President of the United States instead of the Commissioners of the District of Columbia, as was first contemplated.

From the fact that great and unnecessary cruelties are inflicted upon animals in foreign countries and in some of the States of the American Union by vivisectionists, it is reasonable to suppose that the District of Columbia is not entirely free from the abuse. If, however, as was claimed before your committee, such is the fact, the enactment of a law on the subject will do no harm, while if the abuse exists legal restrictions are imperatively demanded; and the fact can be ascertained absolutely only by such impartial inspection as would be made by the inspectors provided by the bill.

It is universally conceded that in some European countries, and especially in France and Germany, the most atrocious cruelties are perpetrated upon animals in the name of science; but in some quarters it has been asserted that such cruelties are unusual in this country. In England, as a result of investigations by a royal commission, vivisection is under governmental restriction, and it is doubtless carried on in a more humane way than formerly. It will be instructive to ascertain some of the practices now in vogue by modern vivisectionists.

From "A clinical and experimental study of massage," by Dr. A. Castex, in Archives Générales de Médecine for January and February, 1892, the following is extracted:

Thanks to Dr. Ch. Richet, I made in his laboratory last summer various experiments on dogs.

First experiment.—Large watch dog. Extended on the vivisecting table on its stomach—the four limbs and head fastened, but not too tightly. * * * With a large, empty stone bottle I strike a dozen violent blows on the thighs. The animal, by its cries, more and more violent, indicates that the bruise is great, and vividly felt (p. 9).

Second experiment.—Large hound. The animal is fixed like the former. Placing myself at a certain height, that my mallet may strike with greater force on the part to be experimented upon, I give, with all the strength of my right arm, twelve successive blows with a great, wooden mallet, some on the deltoid, some on the shoulder, some at the back, some in front. As in the first case, this dog indicates by his cries that the bruises are very painfully felt, after which he falls into a sort of sleep, broken by moans, for ten minutes. After this again he awakes agitated, and seems to suffer more than the first dog.

Sixth experiment (July 18, 1890).—A large watch dog. I try, at first ineffectively, to dislocate the shoulder. I only succeeded in dislocating the elbow and in fracturing the right carpus by torsion. Four days afterwards the animal is worse, has diarrhea, and the eyes are glazed.

* * * It is the more interesting to see the animal use his forepaw, etc.

Seventh experiment.—Large bitch. We proceed without anæsthetics, thinking that they have nullified previous experiments. The animal is fastened on the vivisecting table. I dislocate successively both her shoulders, doing it with some difficulty. * * * The animal, which appears to suffer much, is kept in a condition of dislocation for about half an hour. It struggles violently in spite of its bonds. * * * The autopsy shows that on the left shoulder there had been a tearing out of the small tuberosity and of all the adjoining skeleton (p. 21).

Eighth experiment.—Poodle dog. * * * Replaced on the table with chloral. I dislocate his two shoulders. The animal utters screams of suffering. I hold him for twenty minutes, with his two shoulders dislocated and the elbows tied together behind his back (p. 22).

In the London Echo of August 1, 1894, is a letter signed "T. A. Williams, 48 Martin street, St. Paul's, Bristol," which will bear repetition. It describes a visit to the Pasteur Institute in Paris, and is as follows:

At 10 o'clock on the morning of July 14, carrying an introduction from an English Member of Parliament, I stood outside the famous 25 Rue Dutot, Paris The building stands in its own grounds, which are exceedingly well kept, and at first sight there is nothing to indicate the character of the place, except that running along the front of the building, immediately over the first story, can be read in large stone letters the words, "Institut Pasteur." We are politely informed that the 14th being a national fête day no inoculations will take place, and the next day being Sunday no patients are treated then, but if I will come on Monday morning I shall be shown round.

On Monday, July 16, I was taken direct to the spacious room assigned to those waiting their daily inoculations; some forty persons were already there, and these quickly increased until there could not have been less than a hundred present. Several nationalities and nearly all ages were represented.

While engaged in conversation with a case from Ireland, I was suddenly summoned by the attendant, as the inoculations for the day were about to commence. I was shown to a seat behind the operators; some 70 to 80 inoculations of men, women, and children were performed in about thirty or forty minutes. Presently a door was thrown open and in walked Dr. Roux, who, by the way, is Pasteur's son-in-law, and holds the very lucrative position of director of the institute under him. He was to conduct us over the building.

A GRUESOME SIGHT.

In several of the rooms were lying about the dissected bodies of the animals, and also numbers of them still living, who would be the next subjects for examination, and who were then only waiting the final completion of the slow process of poisoning to bring about their lingering and cruel deaths. At the sight of these animals the two ladies who formed part of the company being conducted by Dr. Roux shrank back with horror depicted upon their faces. "But where, Doctor," said my interpreter, at my request, "are the pens where the larger stocks of animals are kept? Monsieur wishes to see them." But Dr. Roux was obdurate in refusing to show them, as I think, because of the expression of tenderness on the part of the ladies. but these pens were what I most desired to see. I had read descriptions of the laboratories, and followed closely the system through its many stages. "Interpreter, please inquire at the lodge and see if I can come early in the morning to see round the pens," said I; and so the following morning for the third time I stand at Pasteur's great gate behind which exists that

MIGHTY LIVING TOMB

of so many sentient creatures. I am shown a side path, and the attendant unlocks a gate, which I notice is carefully fastened again behind us, running along the length of the grounds. On our right hand are a dozen houses, which might easily be mistaken for stables. These are opened and I enter. They are crowded with cages, baskets, etc., which contain animals in different stages of inoculation. These are removed day by day, as the various viruses develop, until they reach the final stage, which to many of them will be a slow process of "rotting to death." There are hundreds of rabbits, ducks, guinea pigs, fowls, rats, mice, etc Some of these have young developing disease in them. We enter a very high iron building. I walk up and down it, for it is divided into sections, many of which contain a dog whose barking is terrible to hear. I do not recognize in these furious, desperate creatures man's faithful friend. I count twenty-two of them. They are, indeed, appalling to see. Many valuable breeds are among them. One poor wretch has torn and scarred his nose and face in vain attempts to tear away the iron network that exists between him and those who look upon him. He will most likely die soon—die "driven mad."

Leaving the dogs, we turn to the left of the grounds and enter a long room. Here I am

AMAZED AT THE NUMBER OF ANIMALS

kept; there could not have been much less than a thousand; whole cages of rabbits, which I read from a label had been inoculated with "cholera virus;" and bearing the name of Dr. Metchnikoff. I see the rabbits paralyzed in their hind quarters so that they can not move, and they look up to you through glazed eyes—a picture of helpless suffering. Fowls lie slowly dying of tuberculosis. I saw hundreds of eyes red with inflammation, the result of inoculation in their sensitive organs of sight. I count thirty bodies thrown out into different corners of the room, evidently of those whose long sufferings have ceased in the previous night. I walk across the grounds, and stop before a large stove-like object in a corner; it is the crematorium which Pasteur has had erected to burn the bodies of his diseased victims of this much-disputed scientific system. As I hold my nostrils against the most unwholesome stench that ever assailed the sense of man, I count fifty animals awaiting fuel. The busy flies are there, as previous visitors have described, and it seems quite possible for them to carry on their feet and wings the germs of disease, to the danger of the community outside the institute.

AT THE PARIS SCHOOL OF MEDICINE.

After leaving the Pasteur Institute I was fortunate to obtain a card of admission to the Paris School of Medicine, where dogs and monkeys are vivisected by the hun-

dred, and every diabolical cruelty inflicted without the need of license. The building is very large, and as I stood in the courtyard I could hear the barking of dogs kept for the immediate use of the students and the working physiologists. I am anxious to visit Professor R——'s laboratory, and so, pushing open a door, I find myself in a large room filled with the apparatus of torture. An attendant explains to me that there will be no demonstrations by Professor R——, who is, indeed, out of Paris till November. But what, then, mean those dogs about the premises? I had counted thirty. Monkeys, ten in number, were gibbering from their cages, frogs—"God's gifts to the physiologist," as one of them claimed them to be—were there in scores, and three ducks were waddling about in a water vessel that stood four feet high from the ground. These few animals were for the more industrious students who did not go in for recreation, whether of an innocent character or not, but who rather chose to stay and hack away at these living creatures.

I was too late that day to see any experiment. * * * But I saw one of the many vivisecting tables still dripping with the blood of its day's victim. I must leave the place with its terrible associations of suffering.

WHAT HAPPENED TO A DOG.

As I go out of the courtyard at the other angle to which I had entered, I hear the sound of a howling dog coming from a room over whose door I read, "Directeur des Travaux de Physiologie." I entered. The dog, a large Newfoundland, is already bound securely to the table by strong cords to each of his legs; he struggles violently, and shakes and rocks the heavy table, but to no purpose, he can not escape. At his side one of the professors is injecting chloral, which is no true anæsthetic. Presently a knife is taken, the skin of the animal is cut open between the ears, the flesh is cut carefully open down to the skull, but what is that curious instrument in the assistant's hands? He heats it at a gas jet, and a current is set in motion that produces a red heat at the top, and with this he sears the flesh of the mutilated animal; the electric cautery thus prevents the poor lacerated creature from mercifully bleeding to death. I had never expected to smell the burning flesh of a living animal, and it came to me that day as a terribly new experience. A brass plate was screwed upon the skull of the animal, and a hole was made through to the brain with a circular saw, and into this hole was poured an electric current from a battery on the other table; look to it, or the dog, a very powerful one, will escape, all bleeding and torn as he is. With the plunging of the animal the whole arrangement of screws, etc., becomes unfastened; two men hold him, and they fit the plate again and turn more currents of electricity into that brain. Will he never die, I think to myself; and my impulse is to end its misery with my pocketknife; but no, that will not do; and so I watch for more than two hours these infamies perpetrated in the name of science. I never could have believed had I not heard that it was possible for any animal to express human anguish as that one did through that time of torture. That dog groaned as I should have groaned; the thing is simply indescribable. I wish those groans could be heard for five minutes by every English man and woman; if so, vivisection would be prohibited by the concensus of our common humanity, and so, sick and horrified, I left the place, the victim still in the hands of his merciless torturers.

A recent issue of the New York Herald contained the following description of the revolting cruelties practiced in France and Germany by vivisectionists:

Is it right to drill holes into the skulls of animals, to boil them, roast them, torture them, inflict them with all sorts of hideous diseases? To a question boldly put in this way humanity would answer with an unqualified No! But when the question is modified so as to read, Is it right to do all this in the interests of medical science? humanity hesitates.

It has been ably shown in the columns of the Paris Herald that there is no doubt a large body of reputable and even kindly medical men who hold that vivisection, even when it entails all these horrors, is a necessary instrument of science and a potent adjunct to the art of healing. In short, in the nineteenth century the verdict of science for the modern rack, as Miss Frances Power Cobb has accurately named it, is as unanimous as was the verdict of religion in the fifteenth century for the ancient rack. Then, as now, what seemed at stake was the salvation of mankind. A race saved from disease seems quite as noble a conception as a soul saved from hell. The broader views of even the narrowest theologian of to-day, however, would decide that the ancient rack was not really available for the salvation of individuals. When will medical men reach the same opinion about the modern rack?

In the evolution of morals progress has always been marked by the attainment of a wider horizon of sympathy for sentient things and of recognition of their rights. The ancient world had no sympathy for slaves, because slaves had no rights. The

mediæval world had no sympathy for Jews and Mohammedans, because infidels had no rights. We have seen in our day the rising tide of acknowledged rights cover, at least in theory, the whole world of human existence. We have every reason to predict that it will eventually cover the whole world of sentient existence.

BECAUSE ANIMALS HAVE NO RIGHTS.

Certainly if an ordinary man could bring home to himself on the unimpeachable testimony of men employed in vivisection what vivisection really is, the only people who could possibly uphold it would be those who hold that animals have no rights. In the august name of science dumb creatures have been burned, baked, and frozen, starved to death, flayed alive, saturated with inflammable oil and set on fire, pierced with nails, crushed and tormented in every possible way. Human ingenuity has taxed itself to its fiendish utmost to devise some new torture to see what curious results would follow.

Dr. Brachet, of Paris, by various torments, inspired a dog with a rational and consistent hatred for himself. "When the animal became furious, whenever it saw me, I put out its eyes. I could then appear before it without the manifestation of any aversion. I spoke, and immediately its anger was renewed. I then disorganized the internal ear as much as I could, and when intense inflammation made it deaf, then I went to its side, spoke aloud, and even caressed it without its falling into a rage."

The German Von Lesser "plunged a dog for thirty seconds in boiling water." He "scalds another four times at various intervals." Dr. Cartex, of Paris, fastens a dog to the dissecting table without any merciful intervention of anæsthetics, and stands above it with a large empty stone bottle.

"I strike with all my strength a dozen violent blows on the thighs. By its violent cries the animal shows that the blows are keenly felt." His compatriot, Majendie, used to cut the stomach out of living dogs. Mantegazza, of Milan, with a refinement of cruelty, chose animals who were either pregnant or nursing their young. To produce the extreme degree of possible pain he invented a new machine, which he gayly called his "tormentor," and placed in it victims which had been first "quilted with long, thin nails," so that the slightest movement was agony, and then racked them with added torments—tore them and twisted them, crushed them, lacerated them—hour by hour, till crucified nature could endure no longer and sent death as a tardy relief. In his own words, he continued these experiments day by day for a year, not with pity, not with repugnance, but "with much delight and extreme patience."

LEFT SIDE OF HER BRAIN GONE.

All literature can present no more pathetic story than this, which is told by the German professor, Goetz: "A young female dog which had learned to shake hands with both forepaws had the left side of the brain washed out through two holes. On being asked for the left paw the dog immediately laid it in my hand. I now demand the right, but the creature only looks at me sorrowfully, for (through the loss of the left side of the brain) it can not move it. On my continuing to press for it, the dog crosses the left paw over and offers it to me on the right side, as if to make amends for not being able to give the right paw."

Another eminent gentleman made experiments to test the affection of his dog. He gouged out his eyes, and yet the animal still came at his call. He submitted it to all forms of hideous torture until nature brought death to its relief, and the noble brute died licking the hands of its master.

Dr. Noe Walker tells of another scientific enthusiast, whom he had seen take up a mother dog from its young, cut off its mammary glands (its breasts), and put it down, mutilated, bleeding, and dying, among its little ones, whom it could no longer feed, but only licked in its last agony.

No layman, no laywoman especially, can read stories of this kind without being moved, even to tears. There is not an element of pathos lacking. And the men who do these deeds and chronicle them afterwards, are they fiends? Not at all. They are kindly, amiable, well-meaning persons, who at least believe that they are actuated by a noble desire to lessen the sum of suffering in the world. Dr. Bigelow, late professor of surgery at Harvard University, may well say, "If hospital service makes young students less tender of suffering, vivisection deadens their humanity and begets indifference."

A European journal recently described an operation wherein the spinal cord of a dog was destroyed by thrusting a steel probe into the spinal column. The animal evinced its agony by fearful convulsions, but it was permitted to utter no cry that might evoke sympathy, for previous to the demonstration its laryngeal nerves had been cut.

INOCULATION FOR PROLONGED DISEASES.

It is claimed by the advocates of vivisection that anæsthetics are frequently employed to relieve the pain of the operation. But even if this were so, they could do little. A considerable portion of medical investigation at present consists in the production of disease in which the puncture of inoculation is a trifle, while the resulting disease is attended with acute and prolonged suffering. Some experiments last for over a year. The few moments of actual operation are not worth mentioning in comparison with what follows. Moreover, insensibility is rarely induced even in the moments when the pain is most acute. A mere whiff of chloroform might cause the death of an interesting subject. Instead of chloroform, curare is usually administered.

And what is curare? It is a drug which keeps the animals still by depriving them of motion. It does not bring unconsciousness. It does not lessen pain. On the contrary, Claude Bernard complacently informs us that it "causes the most atrocious sufferings which the imagination can conceive." Yet the same authority remarks, without any expression of regret, that its use in vivisection is so universal that it may always be assumed to have been used in experiments not otherwise described.

The Paris Herald has recently been calling attention to the barbarities inflicted at the Alfort Veterinary School. It quotes from a pamphlet published by Mr. Philip G. Peabody, president of the Anti-Vivisection Society of Boston, who obtained admission to this institution last year:

"Incredible though it may seem, eight boys are actually at work vivisecting each horse at the same time. This is not at all an unusual or exceptional vivisection. It is done many times every week at this institution in its entirety. In fact, Professor Cadiot, the ruling genius of the laboratory, explained to me that many of the usual experiments were omitted the day I was there, June 10, owing to the heat and approach of summer. I saw about forty different experiments on the horse in question, and as many were repeated by each of the eight boys. I saw about one hundred surgical experiments actually performed on this one living horse. During the latter part of the time, perhaps for one hour, Dr. Chauveau, the inspector-general of all the veterinary schools in France, was present, and he also took a small part in the work."

DEXTERITY IN TORTURING A BAY MARE.

Mr. Peabody buttresses his own testimony with that of another witness, who tells this story: "A little bay mare, worn out in the service of man, one of eight, on a certain operation day, having unfortunately retained life throughout the fiendish ordeal, and looking like nothing ever made by the hand of God—with loins ripped open, skin torn and plowed by red-hot irons, riddled by setons, tendons severed, hoofless, sightless, and defenseless—was exultingly reared on her bleeding feet, just when gasping for breath, and dying, to show what dexterity had done in completing its work before death took place."

In consequence of this report the Victoria Street Society for the Protection of Animals from Vivisection sent Mr. George Cheverton, an eminent London veterinary surgeon, to investigate, with the result that full credence is given to Mr. Peabody's statements.

Begin on yourselves, O, vivisectionists, and the world will respect you more than it would if you confine your studies to the unconsulted members of the brute creation. A willing victim is preferable to an unwilling one. More than that, a human victim is preferable to an animal. A celebrated Scotch physiologist who tortured thirty-six dogs to ascertain the property of a drug, was obliged to confess to the Royal Commission that what happened to a dog could only suggest what might happen in the case of a man; to make anything certain it would be necessary to try it on a man.

In 1892, Canon Wilberforce, in a public address in London, sharply denounced the practice of vivisection, for which he was called to account by Henry Sewill. The following correspondence, extracted from the London Zoophilist, between Mr. Sewill and Canon Wilberforce, should be read by every man, woman, and child in the United States:

40 WIMPOLE STREET W., *June 23, 1892.*

SIR: In the Times of to-day appears an account of the annual meeting of the Society for the Protection of Animals from Vivisection. It is there stated that in moving the adoption of the report you characterized vivisectors as "human devils." If this be

a correct version of the words you employed you have placed yourself under an obligation either to substantiate or to withdraw and apologize for this expression.

By vivisectors can only be meant the class of physiological investigators engaged in experimentation upon animals. These investigators are convinced of the necessity of such experimentation, not only for the advancement of medical science, but for the elucidation of the phenomena of nature upon which human progress depends. In this conviction physiologists are supported by the highest intellects of the world, including, with scarcely an exception, the great mass of scientific experts who are alone fully qualified to form a correct judgment in such a matter.

The cultivation of science, as it is pursued by the physiological investigator, demands the utmost devotion and willingness to endure self-sacrifice. The one aim must be to elicit truth for truth's sake. Such labor is very seldom in any worldly sense remunerative and rarely gains either applause or popularity. Those who have the privilege of the friendship of practical physiologists, and are best able to estimate their individual worth, must feel deep indignation to find men among the select few in modern society that lead, in every sense of the word, noble lives, stigmatized in the terms you have stated to have employed. Those terms are uncharitable, unjust, and libelous. Their spirit is entirely opposed to the teaching of Christianity and of that Church in which you hold so distinguished a position.

I am, sir, yours, faithfully,

HENRY SEWILL.

Rev. Canon WILBERFORCE.

DEANERY, *Southampton, June 27, 1892.*

SIR: The quotation from the Times to which you refer, consisting of two words only, is obviously a most unfair report of an entire speech. I did not say in that indiscriminate manner, that all persons who practiced vivisection were "human devils." I am aware that many apparently succeed in escaping moral contamination from the atrocious deeds they do in the name of science, and I am prepared to take your word for it that persons capable of inflicting excruciating tortures upon helpless animals live in other respects "noble lives." I did say, and I *emphatically reiterate it,* that persons who were capable of doing certain deeds, *which I enumerated,* such, for example, as leaving a dog crucified to the torture trough, kept alive by artificial respiration, in agony unspeakable, throughout the long hours of the night, and sometimes from a Saturday to a Monday, while they themselves retired to the rest and comfort of their own homes, hoping to find their subject alive for further experiment upon their return to the laboratory, were acting as "inhuman devils." I do not stand alone in the opinion. The Rev. Dr. Haughton (Question 1888, Royal Commission, 1876) said: "I would shrink with horror from accustoming large classes of young men to the sight of animals under vivisection. * * * Science would gain nothing and the world would have let loose upon it a set of *young devils.*"

You say that the spirit of my statement is "entirely opposed to the teaching of Christianity," etc. I reply that the so-called "cultivation of science," as it is practiced by the physiological investigators, "is entirely opposed to the teaching of Christianity;" is based upon the rankest materialism, and appeals to the lowest instincts of man; and, as to "the Church in which I hold a position," etc., I thank God that some of its most eminent representatives have organized within it a league for the "total abolition of the practice of vivisection." And the Bishop of Manchester, himself no tyro in science, preaching on behalf of this league, exposes himself to your "deep indignation," for he, too, stigmatizes vivisectors as men "who use God's dumb creatures as the subjects of tortures which could only be called *diabolical,* and who gain their knowledge by the degradation of their moral character," and with these sentiments I cordially agree.

Our contention is that the public has been blinded by scientific dust thrown into its eyes, and that multitudes are wholly unaware of the unspeakable and fiendish cruelties that are perpetrated in the name of science.

The public is taught to believe that vivisections are rare; that animals subjected to them are under anæsthetics, and that the discoveries made by the process are of infinite value. The public has not realized that 3,000 doctors signed a memorial declaring that an important series of experiments could not be carried through while animals are under anæsthetics; that the archvivisector, Shiff, has been honest enough to say: "It is nothing but hypocrisy to wish to impose on oneself and others the belief that the curarized animal does not feel pain."

Let us glance at some of these so-called "experiments," and judge whether men endowed with ordinary sensibilities and imaginations could perform them without temporarily transforming themselves into "inhuman devils." * * * They include baking, freezing, burning, pouring boiling oil on living animals, saturating them with inflammable oil and setting them on fire, starving to death, skinning alive, cut-

ting off the breasts while giving milk, gouging out the eyes, larding the feet with nails, forcing broken glass into ears, intestines, and muscles, making incisions in the skull and twisting about a bent needle in the brain, etc. (vide The Nine Circles, Swan Sonnenschien & Co., Paternoster Square, in which chapter and verse are given for every experiment described, and a careful perusal of which will provide *abundant* justification for the expression of which you complain).

One of these "practical physiologists," whom you estimate so highly, desired recently to ascertain whether it was possible to pour molten lead into a man's ear when drunk without causing him to shriek. For this purpose he procured several dogs, and the reports says "he administered an anæsthetic composed of a solution of chloral and morphine to reduce the dog to the supposed condition of a drunken man. In spite of this precaution it appears that when the molten lead penetrated the ear of one of the animals, accompanied by a frizzling sound, the wretched beast struggled violently, and its howls were so dreadful that even the *garcons du laboratoire,* accustomed as they are to painful spectacles, were strongly affected."

The second dog, though similarly anæsthetized, was so horribly tortured that it actually burst the thongs which bound it to the torture trough.

Again, could anyone but an "inhuman devil" perform the following:

"At the late Medical Congress, held in Berlin, a Chicago professor performed, before the assembled doctors, some experiments upon a dog. A French journal, in describing it, says that the professor roared out, 'Hand me over that dog.' The unfortunate animal was brought into the room carefully muzzled, and with its legs tied down. The professor then proceeded to pump the poor beast full of sulphureted hydrogen gas. 'Now, gentlemen,' he shouted, 'the gas will issue from his mouth in a stream, and I will set fire to it.' A lighted match was set to the dog's mouth, with no result; a second, a third, a whole box full, and nothing came out of it but burning the hair on the dog's jaws." Then came the second part of the experiment. "'Now, gentlemen,' said the professor, 'you will see the effect when the gas has been pumped into the bowels when they have been wounded.' *He then produced a loaded revolver and fired a bullet into the wretched animal's abdomen.* The dog yelled piteously, and the bleeding creature was subjected to a repetition of the gas injection. The rest of the story was too horrible to tell even in the pages of an English medical journal." (Philadelphia Ledger, December 16, 1890.)

The list of Dr. Brown-Sequard and M. Chauveau's experiments on the spinal marrow are too terrible to describe in extenso. The following will serve as a sample:

"To ascertain the excitability of the spinal marrow, and the convulsions and pain produced by that excitability," the studies were made chiefly on horses and asses who, he says, "lend themselves marvelously thereto by the large volume of their spinal marrow." M. Chauveau accordingly "consecrated 80 subjects to his purpose." "The animal," he says, "is fixed on a table. An incision is made on its back of from 30 to 35 centimeters; the vertebræ is opened with the help of a chisel, mallet, and pincers, and the spinal marrow is exposed."

Several experiments similar to the foregoing are described. In some the spinal marrow was burned through with red hot wire. The electrical stimulation was increased. The spinal marrow tetanized (i. e. convulsed) during three minutes. The vagus several times stimulated. *The operations on the rabbit extended over eleven days.* The wound in the back had suppurated and the stimulation of the exposed nerves was added to by electrodes being fastened to each hind leg causing tetanus (i. e. convulsions) of the back extremities. (Pfluger's Archives, 1888, pp. 303, et seq.) Again, "Fifty-one dogs had portions of the brain hemisphere washed out of the head, which had been pierced in several places. This was repeated four times; the *mutilated creatures and their behavior having been studied for months.* Most of the animals died at last of inflammation of the brain" (p. 415). "Interesting experiment" on a delicately formed little bitch: Left side of brain extracted; wire pincers on the hind feet. Doleful whining; the little animal began again to howl piteously; soon afterwards foamed at the mouth (p. 417). The same dog last operated upon on the 15th of October; since then blind; died on November 10. "The dissected brain resembles a lately-hoed potato field" (p. 418). Little bitch last operated upon on the 26th of May, and made nearly blind; died on the 7th of July."

Do you imagine that I should consider myself under an obligation to apologize for stigmatizing the dastardly perpetrator of the following abomination an "inhuman devil?"

Professor Goltz says that it was "marvelous and astonishing" to find that a dog *that had served for some seven experiments, and whose hind quarters were completely paralyzed, and whose spinal marrow had been destroyed, the animal suffering besides from fatal peritonitis,* was still capable of maternal feelings for its young. "She unceasingly licked the living and the dead puppy, and treated the living puppy with the same tenderness as an uninjured dog might do." (Pfluger's Archives, Vol. IX, p. 564.)

I contend that the language does not exist in which it would be possible to be

"uncharitable, unjust, and libelous," in speaking of such "a labor to elicit truth for truth's sake."

For Paul Bert's reports of his disgusting experiments in amputating the breasts of a goat and other animals see Comptes de la Societe de Biologie, Paris, 1883, p. 193.

"I wrote," he says, "to communicate to the society the results that I have obtained by the ablation of mammæ in animals. Dogs and rabbits with their six or eight mammæ are unable to survive these experiments."

I certainly do not envy you "the privilege of the friendship of practical physiologists," such as these.

Perhaps you will say that these experiments were performed by foreigners, and not by the "select few in modern society that lead, in every sense of the word, noble lives." Then let me refer you to the Report of the Royal Humane Society, 1865, pp. 31–66, for an English experiment, which is only one out of thousands:

"*Experiment 19:*—A terrier was deprived of air by plunging its head into liquid plaster of paris; respiratory efforts commenced at one minute thirty-five seconds, and ceased at four minutes, the heart beating till five minutes. On examining the lungs the white plaster was found throughout the bronchial tubes." *Seventy-six of these experiments were made.* (Report of the Royal Humane Society, 1865, pp. 31–66.)

And the following: Dr. Angel Money reported a series of experiments in which he irritated the brain and intestines of a number of "anæsthetized curarized animals" by electricity, sliced away their brains, and made "windows" in their bowels. (British Medical Journal, August 4, 1883.)

Dr. Bradford, of University College, London, has mutilated the kidneys of dogs. First, he removed a portion of one kidney, which operation must necessarily be of an exceedingly painful nature. At intervals, varying from a fortnight to six weeks, the entire other kidney was also removed, thus leaving the animal with only a portion of one kidney. After the second operation the animal became emaciated, and died at a period varying according to the size of the remnant of kidney remaining. Sometimes the dogs lived a fortnight, sometimes six weeks. (Proceedings of Physiological Society, March 21, 1891.)

The following quotation from Mr. R. T. Reid's speech in the House of Commons, April 4, 1883, refers to English experiments: "I will take one instance from certain experiments performed by Professor Rutherford, and reported in the British Medical Journal. I refer to the series of experiments commenced December 14, 1878. These experiments were 31 in number; no doubt there were hundreds of dogs sacrificed upon other series of experiments, but now I am only referring to one set, beginning, as I say, on the 14th December, 1878. There were in this set 31 experiments, but no doubt many more than 31 dogs were sacrificed. All were performed on dogs, and the nature of them was this. The dogs were starved for many hours; they were then fastened down, the abdomen was cut open, the bile duct was dissected out and cut, a glass tube was tied into the bile duct and brought outside the body. The duct leading to the gall bladder was then closed by a clamp, and various drugs were placed into the intestine at its upper part. *The result of these experiments was simply nothing at all;* I mean it led to no increase of knowledge whatever, and no one can be astonished at that, because these wretched beasts were placed in such circumstances—their condition was so abnormal—that the ordinary and universally recognized effect of well-known drugs was not produced. *These experiments were performed without anæsthetics*—the animals were experimented upon under the influence of a drug called curare."

And now, sir, what "phenomena of nature upon which human progress depends" have been elucidated by these brutal and degrading tortures? What victory over disease can your "scientific experts," who, you say, "are alone fully qualified to form a correct judgment in such a matter," point to as the result of vivisection? Can they cure cancer, consumption, scrofula, or lupus? Is it not a fact that the boasted discoveries of one year are the ludibrium of the next? In spite of the unspeakably cruel experiments of Professor Ferrier, your "scientific experts" do not even yet know the true function of the cerebellum; and the experiments of one physiologist are often pronounced by another to be utterly useless. Harvey testifies himself that the discovery of the circulation of the blood was due to anatomy, and not to vivisection. Some of the most skillful living operators have told me that their skill was attained by dissection of the cadaver, and not by vivisection. Sir Thomas Watson told me himself that it was constantly necessary to unlearn at the bedside the lesson taught in the laboratory. Majendie's holocaust of victims resulted in disastrous failure when his conclusions were tested on the human body. What has humanity gained from the unparalleled cruelties of Koch, who is compelled to keep a special crematorium to dispose of the corpses of his victims; or from the so-called discoveries of Pasteur, who has apparently succeeded in producing a new form of disease, *rabbies paralysis*? The report signed by Sir J. Paget, Sir J. Lister, Dr. Burdon Sanderson, and others, informs us that "under the intensive method deaths have occurred under conditions which have suggested that they were *due to the inoculations rather*

than to infection from rabid animals." At Milan three men died of rabbies after treatment at the Instituto Robico, and the dog by which they were bitten was declared by Professor Pasteur himself *not to have been rabid.* Professor Peter says: "M. Pasteur does not cure rabies; he gives it." And in the Times (November 16, 1888) I read that "in the case of one man sent over to Paris from this country there is reason to believe that the hydrophobia from which he died was rather the result of his inoculation than of the original bite."

You say "the investigators are convinced of the necessity of such experimentation." I reply that an increasing number of intelligent Englishmen, undeterred by what has been well termed (I believe by the late Lord Shaftesbury) "the insolence of physiological science," are convinced of the iniquity, the uselessness, and the peril to the human race of such experimentation, and they are determined to do their utmost to render the practice in this country, at least, wholly illegal.

I am, sir, yours, faithfully,

BASIL WILBERFORCE.

Turning to our own country, we find abundant evidence of the work of the modern vivisectionist, unrestrained by law and uninfluenced by popular opinion. Great institutions of learning in the States of New York, Massachusetts, Michigan, Illinois, and Pennsylvania have made numerous contributions to the sum of suffering inflicted on inoffensive and helpless animals, some of which are too brutal to be reproduced. In the Harvard Medical School cats seem to be the favorite animal for purposes of experimentation. In the Collected Papers of that institution there are records of a vast number of agonizing experiments, of which more than 900 were on cats.

Dr. Walton, at one of the laboratories of Harvard, is said to have made a number of experiments on the excision of the epiglottis. Here are two of his experiments:

Case 9.—Dog; epiglottis excised; watched six days; coughed at almost every attempt to eat or drink.

Case 10.—Large dog; epiglottis excised; observed twenty-one days; choked on swallowing liquids and solids at every trial.

B. A. Watson, A. M., M. D., a prominent physician of Jersey City, made a number of experiments on dogs. He conceived the idea of hoisting a dog up to the ceiling and dropping it upon its back on iron bars in such a manner as to produce concussion of the spine. Some of the dogs lived from a week to ten days. He experimented upon 141 dogs.

Commenting upon Dr. Watson's experiments, which were published in pamphlet form, the British Medical Journal denounced the experiments as utterly useless as regards human surgery or pathology, and added:

There is a callous indifference shown in the description of the sufferings of the poor brutes which is positively revolting.

In the International Journal of the Medical Sciences for October, 1887, Dr. W. S. Halstead, of New York, has an article entitled "An experimental study on circular sutures of the intestines," from which the following is taken:

Experiment A.—Small young dog. Operated on January 18, 1887. Needles with dulled ends employed for sewing. Circular resection of intestine. Two rows of interrupted stitches passed as deep as but not including any portion of submucosa—suture of muscular coat. The stitches tore badly (particularly those of the first row) and had to be frequently retaken.

January 23.—Dog found dead. Autopsy: Suppurative peritonitis; sutures had given way completely.

Experiment B.—Medium-sized dog. Operation January 18, 1887. To include in each stitch a thread of submucosa. Irrigation with solution of corrosive sublimate, 1:1000. Glass clamps; suture, catgut. Two rows of interrupted stitches. The dog was killed on the 19th of February.

Experiment C.—Operation January 20, 1887. To reverse about one foot of intestine. * * * The dog died of shock a few hours after operation, etc.

To satisfy my curiosity, I made Experiments D, E, and F.

Experiment D was on a small brindled and white bulldog (pup). Found dead the day after the operation. Autopsy: Complete slough of flaps and gaping of circular wound.

Experiment E was on a "large, long-haired dog." This animal died on the eleventh day after the operation. * * * The experiment necessitated a good deal of stitching. It died of gangrene.

Eight experiments were performed on dogs with "Lembert's stitches." No. 1, "evidently dying of starvation," was killed. No. 2 was "not lively after operation," and was killed on the twelfth day following. When examined it presented abnormal and diseased conditions, the result of the experiment. Nos. 3, 4, and 5 all "died within two or three days of the operation from purulent peritonitis." No. 6 died under the operation, which was carried on for two hours on a "young, small, brindled dog." No. 7 was found dead two days after the operation connected with the experiment "to isolate loop" had been performed upon it. No. 8, a "rather large black and white dog," was subjected to experiment on January 8, 1887, also "to isolate loop of intestine." On the 9th it was "evidently starving to death." Its abdomen was reopened and "many and very strong adhesions" were found to have resulted from the treatment it had been subjected to.

In another group 15 dogs were dealt with, some of which died from the effects of the experiment, and others were killed when they appeared to be dying from starvation.

In summing up his experiments, Dr. Halstead significantly remarks:

I shall not record the rest of my experiments on circular sutures of the intestines, because most of them seem now rather absurd to me, and none of them admit of classification.

Dr. Albert Leffingwell, in Lippincott's Magazine, says:

There is a certain experiment, one of the most excruciating which can be performed, which consists in exposing the spinal cord of the dog for the purpose of demonstrating the function of the spinal nerves. * * * This experiment, which we are told passes even the callousness of Germany to repeat; which every leading champion of vivisection in Great Britain reprobates for medical teaching; which some of them shrink even from seeing themselves from horror at the torture necessarily inflicted; which the most ruthless among them *dare not* exhibit to the young men of England—THIS *experiment has been performed publicly again and again in American medical colleges* without exciting, so far as we know, even a whisper of protest or the faintest murmur of remonstrance. The proof is to be found in the published statements of the experimenter himself. In his Text Book of Physiology, Professor Flint says, "We have ourselves *frequently* exposed and irritated the roots of the nerves in dogs, *in public demonstration,* in experiments on the recurrent sensibility."

This is the experience of a single professional teacher, but it is improbable that this experiment has been shown only to the students of a single medical college in the United States; it has doubtless been repeated again and again in different colleges throughout the country.

Just think of a dog (a description of which will be found in the Laboratory Researches of Dr. A. M. Phelps) with his foreleg strapped to his back, with pressure at the joint, and the muscles and ligaments put upon the stretch; then done up in a plaster-of-paris bandage, carried forward onto the neck, making a stiff collar which kept his head always to the front and prevented him from gnawing away the bandages. He was kept in this suffering condition for one hundred and forty-five days, and was then killed!

Beyond a doubt vivisection is grossly abused in the United States. As the humane editor of an American medical journal exclaimed:

History records some frightful atrocities perpetrated in the name of religion, but it has remained for the enlightenment and humaneness of this century to stultify themselves by tolerating the abuses of the average physiological laboratory—all conducted in the name of science.

Is it to be wondered at, in view of what is daily happening in this country, that a man of the strong human sympathies which characterize

Col. Robert G. Ingersoll should, in writing to his friend, Philip G. Peabody, of Boston, denounce vivisection in the following startling and perhaps extravagant language?

Vivisection is the Inquisition—the Hell—of Science. All the cruelty which the human—or rather the inhuman—heart is capable of inflicting, is in this one word. Below this there is no depth. This word lies like a coiled serpent at the bottom of the abyss.

We can excuse, in part, the crimes of passion. We take into consideration the fact that man is liable to be caught by the whirlwind, and that from a brain on fire the soul rushes to a crime. But what excuse can ingenuity form for a man who deliberately—with an unaccelerated pulse—with the calmness of John Calvin at the murder of Servetus—seeks with curious and cunning knives, in the living, quivering flesh of a dog, for all the throbbing nerves of pain? The wretches who commit these infamous crimes pretend that they are working for the good of man; that they are actuated by philanthropy, and that their pity for the sufferings of the human race drives out all pity for the animals they slowly torture to death. But those who are incapable of pitying animals are, as a matter of fact, incapable pitying men. A physician who would cut a living rabbit in pieces—laying bare the nerves, denuding them with knives, pulling them out with forceps—would not hesitate to try experiments with men and women for the gratification of his curiosity.

To settle some theory he would trifle with the life of any patient in his power. By the same reasoning he will justify the vivisection of animals and patients. He will say that it is better that a few animals should suffer than that one human being should die; and that it is far better that one patient should die, if through the sacrifice of that one several may be saved.

Brain without heart is far more dangerous than heart without brain.

Have these scientific assassins discovered anything of value? They may have settled some disputes as to the action of some organ, but have they added to the useful knowledge of the race?

It is not necessary for a man to be a specialist in order to have and express his opinion as to the right or wrong of vivisection. It is not necessary to be a scientist or a naturalist to detest cruelty and to love mercy. Above all the discoveries of the thinkers, above all the inventions of the ingenious, above all the victories won on fields of intellectual conflict, rise human sympathy and a sense of justice.

I know that good for the human race can never be accomplished by torture. I also know that all that has been ascertained by vivisection could have been done by the dissection of the dead. I know that all the torture has been useless. All the agony inflicted has simply hardened the heart of the criminals, without enlightening their minds.

It may be that the human race might be physically improved if all the sickly and deformed babes were killed, and if all the paupers, liars, drunkards, thieves, villains, and vivisectionists were murdered. All this might, in a few ages, result in the production of a generation of physically perfect men and women; but what would such beings be worth—men and women healthy and heartless, muscular and cruel—that is to say, intelligent wild beasts?

Never can I be the friend of one who vivisects his fellow-creatures. I do not wish to touch his hand.

When the angel of pity is driven from the heart; when the fountain of tears is dry—the soul becomes a serpent crawling in the dust of a desert.

Indications multiply that the next demand in the name of science (that much-abused word) will be that human vivisection shall be permitted. It is shown that already children have been inoculated with loathsome poisons, for purposes of experimentation. Prof. E. E. Slosson, of the University of Wyoming, recently published a remarkable article in the New York Independent on that subject, in which he propounds this inquiry:

Is science worth the cost? Is a life for a life too high a price?

And then he answers:

No one who knows the value of learning would say it is.

This man continues:

If cats and guinea pigs can be put to any higher use than to advance science, we do not know what it is.

We do not know of any higher use we can put a man to, and we believe, on good authority, that he is of more value than many sparrows. A human life is nothing compared with a new fact in science.

Professor Slosson expresses contempt for those who are foolish enough to think that the aim of science is the cure of disease and the saving of human life. Quite the contrary, for he declares that—

> The aim of science is the advancement of human knowledge at any sacrifice of human life.

That seems to be explicit and unmistakable, and it naturally recalls the fact that on the 3d day of November, 1894, a bill drawn by Dr. J. S. Pyle, of Canton, Ohio, was introduced into the Ohio legislature, the first section of which read as follows:

> That all persons sentenced to death by any court having jurisdiction in the State of Ohio, shall be held as subjects for experimental research; that such experiments shall be conducted in the interest of science and society, and shall be regulated by approved rules of humane treatment to avoid all unnecessary pain; that in the preparation for such experiments where pain would be occasioned, anæsthetics shall be administered to the extent of complete insensibility to pain, and during the progress of the experiment narcotics shall be judiciously used to allay any pain, and the condemned person shall not be maltreated in any way; that after the conclusion of such experiments, the criminal shall again be anæsthetized and put to death while in a deep sleep and entirely insensible to pain; that the executioner shall be an expert physiologist duly appointed and authorized by the State, and that appointments to execute and conduct such experiments, shall be vested in the governor, and shall consist of one executioner and five assistant physiologists, with a like number of deputies, who shall hold their offices for the term of good behavior, except upon proof of incompetency; and no one so appointed shall be removed without sufficient cause, which shall be left to the discretion of the governor, and that all appointments to fill vacancies, caused by death, resignation, or removal, shall be made as prescribed in the foregoing.

Strange as it may seem, this proposition received the indorsement of 7 clergymen, 2 editors, and 5 lawyers. Dr. Pyle is an ardent advocate of vivisection, and he doubtless thinks, as some of the young physicians of the present day are arguing, that its logical and final result will not be attained until living men, women, and children take the place of the brute creation on the dissecting tables of the human butchers who advocate this murderous scheme.

The present bill seems reasonable and wise, the leading provisions of which are so clearly set forth by Mr. Henry B. F. Macfarland in a recent letter to the Washington Times, that it is made a part of this report. Mr. Macfarland says:

> First, the bill does not prohibit, or "virtually" prohibit, vivisection in the District, except in the public schools. It was not stated at the Senate hearing on Friday that it was now practiced in the public schools, but it is known that it is practiced in public schools elsewhere, and it is desirable to prevent that practice from ever being introduced here, if it is not already here. But all the vivisection which the opponents of the bill will admit to be now carried on in the District of Columbia will go right on without the slightest restriction if the bill becomes a law, for all the so-called inoffensive classes of vivisection are expressly exempted from the requirement of the use of anæsthetics, and, according to the opponents of the bill, no other classes of vivisection are carried on here.
>
> The language of the bill is, "The animal must, during the whole of the experiment, be completely under the influence of ether or chloroform sufficiently to prevent the animal from feeling pain, excepting only, that in so-called inoculating experiments or tests of drugs or medicines, the animal need not be anæsthetized nor killed afterwards; nor in tests of surgical procedure need animals be kept completely anæsthetized during the process of recovery from the surgical operation. Otherwise than this the animal must be kept from pain during all experiments."
>
> The "so-called inoculation experiments" are those of which the opponents of the bill make their boast, covering as they do all such work as is involved in the production of "antitoxin," for example. They claim that they are not severely painful, and are very useful. Most of what they claim for vivisection is based on such experiments, for they do not like to tell the public about the torture experiments. They claim that there is practically no other vivisection than this and the other comparatively harmless kinds carried on in Washington.
>
> Taking them at their word, we concede that this kind of experimentation can go right on without anæsthetics, while we ask in the bill that more painful vivisection

shall be carried on only under the use of anæsthetics. No form of vivisection is to be prohibited to medical men or scientists, but they must use anæsthetics for torture experiments. Surely there can be no reasonable objection to this, even on the part of vivisectors.

Second. The other important feature of the bill is section 6, which reads "that the President of the United States shall cause all places where experiments on living vertebrate animals are carried on in the District of Columbia to be from time to time visited and inspected, without previous notice, for the purpose of securing compliance with the provisions of this act; and to that end shall appoint four inspectors, who shall serve without compensation, and who shall have authority to visit and inspect the places aforesaid, and who shall report to the President of the United States from time to time the results of their observations therein, which shall be made public by him."

This is made necessary by the fact that there is no other way of ascertaining what is actually being done in the experimental laboratories except by the visitation of inspectors at unexpected times. If, as the vivisectors say, all their work is humane, they ought to welcome such inspection, and if it is not they need it badly. They objected to the original provision in the bill because it required the Commissioners to appoint the inspectors, while most of the vivisectors here are Government officers, but they can not object to supervision by the representatives of their chief superior, unless they really mean to say that they consider themselves above all law and authority, which would be too un-American for official servants of the people to admit.

Third. The other provisions of the bill are simply to prevent private individuals from practicing vivisection without a license from the Commissioners of the District of Columbia, to be obtained on certificate from medical men that they are suitable persons for such work, and also to prevent exhibitions to the general public of vivisection.

This is all there is to the bill, which ought to have the support of every humane person. The very fact that the vivisectors are opposing so moderate and reasonable a measure confirms the suspicion that they are doing in Washington the terrible things vivisectors are doing elsewhere in the United States and publishing in medical journals and books. Finally, if the Washington Humane Society could reach this matter under existing law it would not be appealing to Congress for this legislation. But it is because vivisection is held to be outside the humane laws that this bill is being pressed by those who believe that no man, however humane he is, is fit to be trusted with absolute, unregulated, and unsupervised power over sentient creatures.

Your committee esteem it a special privilege to bear cheerful testimony to the self-sacrifice and benevolence of the medical profession as a whole. Devoting their lives to the alleviation of human suffering and the cure of disease, so far as that can be accomplished by human instrumentalities, they deserve and should receive encouragement and support from the general public, and no legislation should be enacted that would unnecessarily hamper them in their pursuit of useful knowledge, but at the same time it must be conceded that such of them as claim the right to torture and destroy the brute creation in the investigation of alleged new discoveries in physiological science should cheerfully place themselves under such restrictions and supervision as the wisdom of Congress may deem advisable and necessary. Doubtless many vivisectionists exercise the greatest possible care to minimize the sufferings of the poor creatures upon whom they experiment, but, on the other hand, there is overwhelming evidence that others are utterly regardless of the amount of unnecessary torture which they inflict. While the former class do not need legal enactments to govern their conduct it is manifestly the duty of the lawmakers to see that laws are enacted that will reach those who are less considerate and humane, and who are apparently deaf to the moans and cries of the helpless victims whose bodies are mutilated and tortured, not only in pursuit of primary knowledge but also to illustrate facts long before established, and which can as well be taught didactically as otherwise.

In concluding this report it is proper to say that, while the committee was unanimous in recommending it, the writer of the report can alone be held responsible for its phraseology. Notwithstanding all that

he has endeavored to do for the medical profession in the District of Columbia he has already been characterized as an enemy to mankind by a few of the ultra advocates and teachers of vivisection, and he is fully prepared for a deluge of denunciation from that source, which he has no desire to ask the other members of the committee to share. Recognizing the right of vivisectionists to hold tenaciously to their honest opinions and convictions those who differ from them should be granted the same privilege, keeping in mind the fact that it was no less an authority than the world-renowned Dr. Forbes Winslow, editor of the London Journal of Psychological Medicine, who declared:

In my opinion, vivisection has opened up no new views for the treatment and cure of diseases. It is most unjustifiable and cruel, and in no way advances medical science. I do not believe in many of the so-called experiments made by these "faddists," especially those relating to brain operations on monkeys and the consequent theory of cerebral localization. I have probably more experience than many of these experimenters who have given their opinions to the world as based on what they have done, and I beg leave to express my utter disbelief in the usefulness of such experiments, and to discredit their being followed by any good results to mankind or to science in general.

Your committee report the following amended bill, and recommend its passage:

A BILL for the further prevention of cruelty to animals in the District of Columbia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter no person shall perform on a living vertebrate animal any experiment calculated to give pain to such animal, except subject to the restrictions hereinafter prescribed. Any person performing or taking part in performing any experiment calculated to give pain in contravention of this act shall be guilty of an offense against this act, and shall, if it be the first offense, be liable to a penalty not exceeding one hundred and fifty dollars, and if it be the second or any subsequent offense shall be liable, at the discretion of the court by which he is tried, to a penalty not exceeding three hundred dollars, or to imprisonment for a period not exceeding six months.

SEC. 2. That the following restrictions are imposed by this act with respect to the performance on any living vertebrate animal of an experiment calculated to give pain to such animal; that is to say:

(*a*) The experiment must be performed with a view to the advancement by new discovery of physiological knowledge or of knowledge which will be useful for saving or prolonging life or alleviating suffering; and

(*b*) The experiment must be performed by a person holding such license from the Commissioners of the District of Columbia as is in this act mentioned, or by a duly authorized officer of the Government of the United States or of the District of Columbia; and

(*c*) The animal must, during the whole of the experiment, be completely under the influence of ether or chloroform sufficiently to prevent the animal from feeling pain, excepting only that in so-called inoculation experiments or tests of drugs or medicines, the animal need not be anæsthetized nor killed afterwards, nor in tests of surgical procedure need animals be kept completely anæsthetized during the process of recovery from the surgical operation. Otherwise than this the animal must be kept from pain during all experiments; and

(*d*) The animal must, if the pain is likely to continue after the effect of the anæsthetic has ceased, or if any serious injury has been inflicted on the animal, be killed before it recovers from the influence of the anæsthetic which has been administered; and

(*e*) No experiment shall be made upon any living creature, calculated to give pain to such creature, in any of the public schools of the District of Columbia; provided as follows, that is to say:

First. Experiments may be performed under the foregoing provisions as to the use of anæsthetics by a person giving illustrations of lectures in medical schools, hospitals, or colleges on such certificate being given as in this act hereafter mentioned; that the proposed experiments are absolutely necessary for the due instruction of the persons to whom such lectures are given, with a view to their acquiring physiological knowledge or knowledge which will be useful to them for saving or prolonging life or alleviating suffering.

Second. The substance known as urari or curare shall not, for the purposes of this act, be deemed to be an anæsthetic; and

Third. Notwithstanding anything in this act contained, no experiment calculated to give pain shall be performed on a dog or cat, except upon such certificate being given as in this act mentioned, stating, in addition to the statements hereinbefore required to be made in such certificate, that for reasons specified in the certificate the object of the experiment will be necessarily frustrated unless it is performed on an animal similar in constitution and habits to a cat or dog, and no other animal is available for such experiment; and an experiment calculated to give pain shall not be performed on any horse, ass, or mule, except on such certificate being given as in this act mentioned, that the object of the experiment will be necessarily frustrated unless it is performed on a horse, ass, or mule, and that no other animal is available for such purpose; and

Fourth. Any exhibition to the general public, whether admission be on payment of money or gratuitous, of experiments on living animals, calculated to give pain, shall be illegal.

Any person performing or aiding in performing such experiment shall be deemed to be guilty of an offense against this act, and shall, if it be the first offense, be liable to a penalty not exceeding one hundred and fifty dollars, and if it be the second or any subsequent offense, shall be liable, at the discretion of the court by which he is tried, to a penalty not exceeding three hundred dollars or to imprisonment not exceeding six months; and any person publishing any notice of any such intended exhibition by advertisement in a newspaper, placard, or otherwise, shall be liable to a penalty not exceeding ten dollars.

A person punished for an offense under this section shall not for the same offense be punishable under any other section of this act.

SEC. 3. That the Commissioners of the District may insert, as a condition of granting any license, a provision in such license that the place in which any such experiment is to be performed by the licensee is to be registered in such manner as the said Commissioners may from time to time by any general or special order direct: *Provided,* That every place for the performance of experiments for the purpose of instruction shall be approved by the said Commissioners, and shall be registered in such manner as the said Commissioners may from time to time by any general or special order direct.

SEC. 4. That the Commissioners of the District, upon application as hereinafter prescribed, may license any person whom they may think qualified to hold a license to perform experiments under this act: *Provided only,* That a license shall not be granted to any person under the age of twenty-five years, unless he be a graduate from a medical college, duly authorized to practice medicine in the District of Columbia.

SEC. 5. That the Commissioners of the District may direct any person performing experiments under this act from time to time to make reports to them of the methods employed and the results of such experiments, in such form and with such details as the said Commissioners may require.

SEC. 6. That the President of the United States shall cause all places where experiments on living vertebrate animals are carried on in the District of Columbia, to be, from time to time, visited and inspected without previous notice for the purpose of securing compliance with the provisions of this act; and to that end shall appoint four inspectors, who shall serve without compensation, and who shall have authority to visit and inspect the places aforesaid, and who shall report to the President of the United States from time to time the results of their observations therein, which shall be made public by him.

SEC. 7. That any application for a license under this act, and for a certificate to be given as in this act mentioned, must be signed by three physicians duly licensed to practice and actually engaged in practicing medicine in the District of Columbia, and also by a professor of physiology, medicine, anatomy, medical jurisprudence, materia medica, or surgery in the medical department of any duly established reliable school or college in the District of Columbia: *Provided,* That when any person applying for a certificate under this act is himself one of the persons authorized to sign such certificate, the signature of some other of such persons shall be substituted for the signature of the applicant.

A certificate under this section may be given for such time or for such series of experiments as the person signing the certificate may think expedient.

A copy of any certificate under this section shall be forwarded by the applicant to the Commissioners of the District, but shall not be available until one week after a copy has been so forwarded.

The Commissioners of the District may at any time disallow or suspend any certificate given under this section.

SEC. 8. That the powers conferred by this act of granting a license or giving a certificate for the performance of an experiment on living animals may be exercised by an order in writing, under the hand of any judge of a court of record having criminal jurisdiction in the District, in a case where such judge is satisfied that it is essential for the purpose of justice in a criminal case to make such experiment.

CORRESPONDENCE.

HEALTH DEPARTMENT, DISTRICT OF COLUMBIA,
Washington, May 27, 1896.

SIR: We desire to invite your attention to one of the statements which appears in your report upon the bill for the regulation of vivisection in the District of Columbia (as printed in the Evening Star, May 26, 1896), which indicates that the subcommittee having this bill in charge has been misinformed as to the proceedings of the committee appointed by the Commissioners of the District of Columbia to draft such a bill as might be needed to regulate vivisection in this District. We would hesitate to accept the published statement as correct, and would wait for the issue of the official copy of the report, but the statement to which we are about to call your attention is so inaccurate that it may be possible to correct it before such report is printed. We are constrained, therefore, to invite your attention to the following facts at this time:

The article which appeared in the Star, referring to the report of your committee, says:

"It first gives the text of the original McMillan bill, stating that after a hearing before the District Commissioners it was referred by them to a committee consisting of Surg. Gen. George M. Sternberg, U. S. A., Dr. William C. Woodward, health officer of the District, and Mr. Henry B. F. Macfarland, 'to consider the bill and report what modifications, if any, were desirable.' This committee could not agree, as the medical men insisted that no legislation whatever was needed, while Mr. Macfarland desired to carry out the intention of the Commissioners. The result was that Drs. Sternberg and Woodward submitted protests against the proposed legislation, while Mr. Macfarland advised the enactment into law of the modified bill, which your committee have unanimously agreed to report, and which he had prepared to meet the objections which had been raised to particular provisions of the original bill."

The actual facts in the case are as follows:

Surgeon-General Sternberg drafted a bill for the regulation of vivisection in the District of Columbia and submitted it to the committee. In the opinion of the undersigned, a majority of the committee, this bill was as far-reaching in its provisions as it was proper to make it in the absence of any known conditions, either present or prospective, requiring legal restrictions; it did not, however, meet with the approval of Mr. Macfarland. The undersigned therefore proposed to enter into any investigation which Mr. Macfarland might suggest, in order to discover what were the conditions which demanded any modification of the bill drafted by General Sternberg, or, in fact, which demanded any legislation upon the subject. To this proposition Mr. Macfarland declined to accede. We therefore "agreed to disagree," and submitted separate reports. The undersigned did not feel able, in the absence of any definite knowledge as to the conditions which demanded legislation, to draft a bill which would meet the conditions which were alleged to exist, but which had not yet been demonstrated.

It will be seen from the above statements that the majority of the committee agreed upon a bill, and, further, offered to make any investigation which might be suggested by the representative of the Washington Humane Society to discover what modifications of this bill, if any, were needed; but the representative of the Washington Humane Society, Mr. Macfarland, declined to accede to the measure proposed or to enter into any investigation of the subject.

It is believed that it will only be necessary to call your attention to the above discrepancy between the facts as they exist and as they are stated in your report in order to have the necessary correction made.

Very respectfully,

GEO. M. STERNBERG.
WM. C. WOODWARD.

Hon. J. H. GALLINGER,
United States Senate, Washington, D. C.

UNITED STATES SENATE,
Washington, D. C., May 29, 1896.

GENTLEMEN: I have received your valued favor of the 27th instant, and have carefully considered its contents. I see nothing in it that makes it necessary to alter that passage of the report to which you refer, and which is correctly quoted in the Washington Evening Star of May 26.

The only official report of what your committee did to which I have had access completely sustains the statement which you have challenged. The Commissioners of the District of Columbia, in a communication dated March 14, 1896, and

addressed to the Senate Committee on the District of Columbia, stated that your committee had been appointed by them, and had considered the McMillan bill, and that as a result they transmitted letters from Dr. Sternberg and Dr. Woodward, and a draft of a modified bill prepared by Mr. Macfarland.

Dr. Sternberg, in his letter dated February 1, 1896, and addressed to the Commissioners, says, referring to the McMillan bill: "As stated to you, no facts have come under my observation or to my knowledge which will justify you in presenting a bill upon this subject for the action of the Congress of the United States;" and the rest of his letter is simply an elaboration of this protest. Dr. Woodward, in his letter dated February 25, 1896, and addressed to the Commissioners, says: "The proposed law is not called for by conditions at present existing in this District, nor are there any conditions likely to arise demanding the enactment of such legislation as a preventive measure. I see no reason why the Congress of the United States should be asked to give its time to the consideration of such a law in the absence of any conditions, present or prospective, that will likely be rectified by it."

The remainder of Dr. Woodward's letter only condemns in detail the proposed legislation. No substitute measure is even mentioned, much less recommended, by either Dr. Sternberg or Dr. Woodward. The attitude taken in these communications is precisely the same as that assumed by Dr. Sternberg and his supporters at the hearing before the subcommittee of the Senate Committee on the District of Columbia, where he and they opposed all legislation on this subject. It will be remembered that, in answer to a direct question, Dr. Sternberg unhesitatingly stated that no legislation was necessary or desirable. I have no reason to believe that either of you has held any other position throughout this controversy.

Therefore, if any such proposition as you mention was proposed by you in the meeting of your committee it must have been so tentative or so irrelevant as not to have been seriously considered, and the fact remains that you were protesting against legislation while Mr. Macfarland was endeavoring to construct legislation.

This came out clearly at the hearing before the subcommittee of the Senate Committee on the District of Columbia, when Dr. Sternberg alluded to the so-called draft of "A bill to regulate vivisection," said to have been submitted by him in your committee discussions, and Mr. Macfarland, who was present, required and obtained the admission from Dr. Sternberg that it exempted in terms from its operation all medical men and Government officers, who are the only persons carrying on vivisection in the District of Columbia, according to your claims. Such a proposition could not have been seriously considered by anyone, and it does not appear to have had even your unqualified support.

With a view to placing this matter before both parties in interest, I will take the liberty to print this correspondence in connection with the report.

I have the honor to be, very respectfully, yours,

J. H. GALLINGER.

Drs. STERNBERG and WOODWARD,
Washington, D. C.

UNITED STATES SENATE.

COMMITTEE ON THE DISTRICT OF COLUMBIA.

VIVISECTION.

HEARING ON THE BILL (S. 1552) FOR THE FURTHER PREVENTION OF CRUELTY TO ANIMALS IN THE DISTRICT OF COLUMBIA.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1896.

VIVISECTION IN THE DISTRICT OF COLUMBIA.

WASHINGTON, D. C., *April 17, 1896.*

The subcommittee met at 2 o'clock.

Present: Senators Gallinger (chairman of subcommittee), McMillan, Bacon, Wetmore, Martin, and Gibson.

Mr. Curtis, of the House Committee on the District of Columbia, was also present at the hearing by request of the Senate Committee.

Senator GALLINGER. As time is very valuable to most of us, we trust you will be as concise as possible. At the same time, it is the desire of the subcommittee to treat both sides with the utmost fairness and courtesy and to allow as much time as is required to present properly both sides of this question. I will take the liberty to inquire of the parties representing each side of this question what their wishes are in regard to the length of time to be allowed, and we will endeavor to make an arrangement as to the division of the time that will be satisfactory to each.

Mr. R. ROSS PERRY. What total time would the committee feel disposed to give? Then we can divide it.

Senator GALLINGER. The question has been submitted to the chairman of the subcommittee as to whether it would not be the proper thing for the advocates of the bill to have the opening argument, and then a brief time for rejoinder. I think that is a reasonable request, and is the usual course in hearings of this nature. How many are to be heard on each side?

Mr. PERRY. We desire three men to be heard on our side—two in opening and one in closing.

Senator GALLINGER. How much time do you desire for yourself and the other two?

Mr. PERRY. To properly present this subject would require a good deal of time, probably more than you can give. In that case we will be able to give only a skeleton argument.

Senator GALLINGER. Do you desire, Mr. Perry, to make the closing argument?

Mr. PERRY. I propose to open, Mr. Kennedy will follow, and Dr. Leffingwell will close.

Senator GALLINGER. Dr. Sternberg, I believe you represent the opponents of the bill. What are your wishes?

Dr. STERNBERG. Mr. Chairman, we did not know of this hearing until to-day, and were compelled to come here without any previous preparation. We will be governed entirely by the time that will be given. I should say that whatever time is granted to the other side will be acceptable to us, and that we will select three from our side to speak if that is the number that will present the other side. I feel very sure that we will find it difficult to conclude the hearing to-day

if so many gentlemen are to speak. I know there is a delicacy on the part of the chairman to limit the time that the parties interested in a great question like this may desire to occupy.

Senator GALLINGER. Then, Mr. Perry, would an hour be satisfactory to yourself and the gentleman who is to follow you, giving additional time to Dr. Leffingwell to close?

Mr. PERRY. I think so.

Senator GALLINGER. Dr. Sternberg, would an hour be satisfactory to your side?

Dr. STERNBERG. I think so.

Senator GALLINGER. We will then proceed with that arrangement. One hour will be given to the advocates of the bill, one hour to the opponents of the bill, and then Dr. Leffingwell in closing will be allowed—how much time do you desire, Doctor?

Dr. LEFFINGWELL. About twenty-five minutes.

Senator GALLINGER. Then twenty-five minutes will be allowed to Dr. Leffingwell to close. That arrangement will give the advocates of the bill a little more time, but somebody has to close and I think courtesy usually grants that to the advocates of a bill. Suppose we allow the opponents an hour and a quarter. Is there any objection to that, Mr. Perry? If we are not able to get through to-day, we will come to-morrow.

Mr. PERRY. That will be satisfactory.

Senator GALLINGER. Before the hearing commences I would like to request the people present to observe the utmost quiet during the hearing. I, myself, am very desirous of being instructed on this subject, and I know the other members of the committee are as well. We will endeavor to have the hearing conducted very orderly.

Before Mr. Perry proceeds, I desire to introduce as part of this hearing certain letters which I have received both for and against this bill. I will read the names of the writers and will ask the clerk to have the letters themselves printed as a part of this report. I have received letters in favor of the bill from the following: Dr. T. A. Wales, Elmira, N. Y.; Dr. James Neil, 1712 Madison avenue, New York, N. Y.; Dr. Thomas G. Morton, 1421 Chestnut street, Philadelphia, Pa.; Dr. Edward W. Avery, 16 Hancock street, Brooklyn, N. Y.; Dr. Matthew Woods, president of the American Antivivisection Society, 118 South Seventeenth street, Philadelphia, Pa.; Dr. Frank Woodbury, 218 South Sixteenth street, Philadelphia, Pa.; Dr. William G. Hartley, 335 West Thirty-fourth street, New York City, N. Y.; Dr. Beverley O. Kinnear, 150 West One hundred and twenth-eighth street, New York, N. Y.; Dr. W. S. Tremaine, 410 Elmwood avenue, Buffalo, N. Y.; Dr. Isaac D. Meacham, Binghamton, N. Y.; Dr. L. W. Cole, Springfield, Mass.; Dr. J. H. Helmer, Lockport, N. Y.; Dr. Samuel Sexton, 12 West Thirty-fifth street, New York, N. Y.; Dr. Allan Mott Ring, Arlington Heights, Mass.; Dr. Edwin A. W. Harlow, Wollaston, Mass.; Dr. A. S. McClean, Springfield, Mass.; Dr. W. P. Roberts, Minneapolis, Minn.; Dr. Edward Frankel, 217 East Seventeenth street, New York, N. Y.; Dr. E. L. Draper, 180 Walnut street, Holyoke, Mass.; Dr. E. H. Hawks, Lynn, Mass.; Philip G. Peabody, A. M., LL. B., president of the New England Antivivisection Society, Boston, Mass.; Cynthia Fairchild Allen, secretary Illinois Antivivisection Society, Aurora, Ill.; Dr. C. H. Brockway, Worcester, Mass.; Dr. Israel T. Hunt, Boston, Mass.; Dr. W. C. Bouton, 320 Fifty-seventh street, Chicago, Ill.; Dr. Jesse Myer, Kingston, N. Y.; Dr. H. D. Champlin, 455 Clark avenue, Cleveland, Ohio; Dr. L. E. Rauterberg, 510 Fifth street NW., Washington, D. C.;

Dr. Clinton Wagner, 19 East Thirty-eighth street, New York, N. Y.; Dr. John H. Holmes, superintendent of the Humane Society of Missouri, St. Louis, Mo. In opposition to the bill I have letters from the following: Dr. H. P. Bowditch, professor of physiology, Harvard Medical School, Boston, Mass.; Dr. William Patten, professor of zoology and general biology, Dartmouth College, Hanover, N. H.

Mr. PERRY. Mr. Chairman, I learn that Dr. Leffingwell must leave town this evening. May I ask if it will be possible to conclude this hearing this evening?

Senator GALLINGER. I will say that as an individual member of the subcommittee, I will stay until half past 6 o'clock if necessary.

Mr. PERRY. Then I will take twenty minutes, Mr. Kennedy twenty minutes, and Dr. Leffingwell twenty minutes in closing.

Senator GALLINGER. I think that will be satisfactory.

STATEMENT OF MR. R. ROSS PERRY.

Mr. PERRY. It must be very apparent to you, gentlemen, that upon so large a subject as this little else can be done in the time allowed than to present the mere outlines of our position in order that you may ponder upon them at your leisure. Perhaps the members of the committee may not all be aware of the history of this movement. This is not its initiation.

About 1876 the agitation was begun in England, and such statements were there published in the press with respect to the experiments conducted in Paris, Berlin, Vienna, Milan, and other European cities as to induce the English public to consider the nature of these experiments. The matter was brought before Parliament by the introduction of a bill designed to repress vivisection. A commission was appointed by Parliament, and this commission sat for some months examining prominent physicians of England and the Continent who were in favor of and engaged in this practice, and also those who were opposed to it, besides others who were not physicians, but who were interested in the subject. The report of that commission is contained in a volume which I will ask the committee to examine. The bill which ultimately passed Parliament was based upon the report of that commission. That bill has been in force in England since 1876.

This bill is the first one which has ever been introduced, so far as I know, in Congress upon this subject. It is not so much to our reproach that this is true as would appear, because we must recollect that England is centered in London. There is probably no city in the world where a great movement can be so promptly effected as in London. There is no country in the world so centralized as to its capital as Great Britain is. Accordingly, there were interested in the discussion of this question in London the very foremost men in England among the nobility as well as the medical profession; and among the people at large it excited the greatest interest.

In this country the fact that so humble a person as myself is the first one to speak here to-day upon this subject is to be regretted, I think, as is also the fact that in this country we are not organized as they are in England. The friends of this bill in Massachusetts do not come to Congress to effect a reform. They direct their attention to Boston. The same is true as to the people of New York and other large centers.

The object of this bill is to restrict all forms of vivisection. It has been urged in connection with this subject that these physicians, many of them, are engaged in experiments which do not involve pain. Suffice

it to say in respect to that, that the position we occupy is this, that no one should be at liberty without any control from the law to practice torture upon conscious animals. That is what our vivisection bill means. It is a measure which is designed to prevent the infliction of torture upon conscious animals. A word may be said in regard to this general subject of torture, and only a word. I have had occasion to speak before the Commissioners of the District of Columbia on this subject, and I would have the members of this subcommittee to read what I have said. If there is no objection I will submit what I then said as a part of my remarks at the present time.

Senator GALLINGER. We will be pleased to have you do so, Mr. Perry.

Mr. PERRY. I had some doubt, until I came here this afternoon, as to the extent to which vivisection had reached in the District of Columbia. That doubt has been dissipated. I think there can be nothing offensive in my noticing the presence here of the Surgeon-General of the United States Army, of the president of the Medical Society of the District of Columbia, of certain professors in local medical colleges, and of others, doctors I presume, with whom I am not acquainted. And these gentlemen are here, I take it, to oppose a bill that simply seeks to regulate vivisection.

I might talk here for hours, and yet I could say nothing to you which would be so potent as this presence in urging the necessity of this bill. So far as I am advised, this is the first bill that has ever been introduced in the Congress of the United States to in any degree protect animals from the infliction of what everyone must admit to be most horrible, inexpressible torture. It is not to the credit of the American nation that this is a fact.

I sent over, some months ago, to England and procured there the book which I hold in my hand; it is a report of the Royal Commission on Vivisection, printed in 1876, a little before the date of the first English act upon the subject. When this subject was agitated in England, it appealed to a public which responded at once through the utterances and the activity of its foremost men. The evil to be remedied was so great that Catholic and Protestant, the dignitaries of the English Church, of the bench and bar, members of the nobility, of the medical profession—such men as Professor Huxley, to mention one name only—many, many, responded; the British Parliament constituted a royal commission to inquire into this matter. This commission sat for months and they took (I have this book of double pages here) over 300 pages of testimony. Finally there was a report made, signed by the names which my friend Mr. Kennedy has read, including that of Prof. T. H. Huxley, unanimously indorsing the principle of restricting, of confining the right of pursuing these terrible experiments; one member of the commission, Richard Holt Hutton, submitted a supplementary report, in which he urged that domestic animals, such as dogs and cats, should especially, for certain reasons which he gave, be exempt from any experimentation whatever.

About twenty-five years ago that law was passed in England, and it is the law there to-day. Now, I say, it is not to our credit that here in America this bill should be the first one that has ever been introduced in the Congress of the United States upon this subject. To-day, so far as I know, there is no law anywhere in this country, from the Atlantic to the Pacific, or from Canada to Mexico—no law anywhere which interferes with the most heartless man in the infliction of unnamable cruelty, if only he says that he performs these experiments in the name of science.

This bill is not my bill. I want to say, before I speak of the bill itself, some words which I can not omit in justice to myself, and which I think express a profound truth. I want to say, in the first place, that I am not here in any professional capacity. But I do say that, after an experience of almost thirty years at the bar, during which I have represented a great many clients—men, women, and children—I never in my life stood before my fellow-man feeling a deeper interest in any cause than I feel in that which I do represent here. I do feel that, weak as my tongue may be, it has to speak for dumb mouths; I do feel that no man could ever appear for more helpless, suffering clients than these silent creatures whose mouthpiece I am. I pity that man who can not feel what I feel. I am unwilling to believe that any of these men here do not feel with me. No man who has known the faithful love of a dog, who has had the service of a horse—the patient, uncomplaining service of a horse—can fail to feel as I feel. If there be among you one who can not so feel, I pity him and pass on.

I recollect one of Charles Reade's novels—I think it is called "Foul Play"—whose plot involves the wrecking of a ship and the casting away of the hero and heroine upon an island. There are two sailors cast away at the same time; one is so much injured that a few hours after he reaches shore he dies, and is buried near a brook. The other one, also hurt, lingers on for some time, plainly failing daily. One day the lovers go off to a distant hill to see if they can discern any signs of a sail; coming back they miss the sailor at the tent, nor can they find him in his accustomed haunts. Finally they think of the grave of his fellow-sailor, and there they see him stretched out on the grave, Charles Reade says, "almost as faithful as a dog."

I speak for these helpless friends and servants and fellow-creatures, gentlemen, and I must say for myself—I must say here, speaking for them—if it were possible to accomplish it, I should urge nothing less than what is demanded by the foremost men to-day in England who are not engaged in this pursuit; I should urge, I say, nothing less than the total prohibition of it, as a thing that in its very nature must recoil upon those who practice it, upon those who witness it, and, through them, upon the whole body politic.

As we grow older I think we become more appreciative of the sacredness of mere life. I think men do not want to wantonly kill anything. We can not give life, and we do not want to take away what we can not give. Concede, as conceded it must be, that life may be taken—for we may take the life of men in self-defense, we may take the animals for our food—and yet it remains a pregnant fact, which I think we do not give sufficient thought to, that there are hundreds of millions of our fellow-men who believe in a religion which regards mere life as so sacred that its votaries are not allowed to destroy a living thing. This is a significant fact, and perhaps we may learn something even from the Hindoos in this connection.

But, be that as it may, I say that it seems to me that nothing can be urged in favor of torture. There is nothing that can draw healthy life or sustenance from torture. It is something which absolutely poisons any fruit, if you may call it fruit, that it can produce. Why is it we see everywhere that this horrible thing—torture—is repudiated as society advances and as civilization increases? Why was it that it was thought necessary a hundred years ago, when the Constitution of these United States was framed, or rather when the first amendments were added, to make torture the subject of a special amendment? Why was it that the eighth amendment to the Constitution provided that cruel and

unusual pains should not be inflicted? Why is it that they are not inflicted to-day in any civilized country? Why is it that not over a hundred years ago when a man was convicted in England of treason he was drawn and then hanged, and then cut down and disemboweled, and then his bowels were burned before his face, and then he was quartered? Why is it that this is not the law to-day?

Why is it that in this country there has blossomed, as I think, the fairest flower of the legislation of to-day—this exquisite law that reaches sweet hands of mercy down to these animals, and says that no one shall inflict cruelty upon them? Is not the answer simply this? Is it not that men—not sentimental men, but statesmen, both those who are framing the laws of a nation, and also those who are developing these laws, have recognized the fact that although cruel and unusual pains may be nothing more than criminals deserve, yet because legislation has something more to think of than the suffering of the criminal, these pains can not be inflicted? While it is true that the criminal would suffer, the inflicters would suffer in greater degree than the criminal, and there would follow from those who looked at that cruelty—there would follow a horror of it at first, and then a pleasure in it, and from the pangs of the one criminal there would spring the seeds of other crimes. Those who witnessed it would first shudder, then enjoy, then imitate. That is the reason of it.

Do not tell me that I am talking of any sentimentality when I am speaking of what statesmen, who presided over the birth of the Constitution of the United States, estimated at so great value that they made an amendment specially designed to cover it.

Now, let me tell you why this is so important a truth, and in doing so I will read from an author whom gentlemen on the other side will not dissent from. It is well to recollect the rock from which we were hewn. What does Professor Huxley say man originally was? I read from his pamphlet on agnosticism:

> I know of no study which is so inutterably saddening as that of the evolution of mankind as it is set forth in the annals of history. Out of the darkness of prehistoric ages man emerges with the marks of his lowly origin strong upon him. He is a brute, only more intelligent than other brutes; a blind prey to impulses, which, as often as not, lead him to destruction; a victim to endless illusions, which make his mental existence a terror and burden and fill his physical life with barren toil and battle.

I say that is where we started. According to you scientists, that is where we started. To what point have we come? I do not want to speak with any rhetoric to you to-day of the attainments of the men of the nineteenth century. You can look back through the ages and see humanity flowering in self sacrifice, in generosity, in all of those mental and moral qualities which distinguish the men of to-day from this brute—our father, as Professor Huxley says.

It has been said by those of that school that the chastity of women has grown out of the thousands who have been stoned to death for adultery. I take your own school. Just pause a moment; think of these long, dark centuries during which this poor creature, man, is toiling up through blood, suffering, ignorance, and tears, and finally, after this almost infinitely slow process, getting only a little advanced, only a little away from all this horrid instinct, this genius which he has for torture and which only he, so far as I know, has forever with him. It is a curious thing, a mysterious thing. There is the feline tribe among the lower animals, and man among the highest, only those having this instinct of torture, this pleasure in the inflicting and beholding of suffering and of blood.

Now, I say we have gotten by these struggles, we have painfully gotten, from Huxley's prehistoric man up to the man of the nineteenth century, and I say it is important for the preservation of the race that we at least stay there. What is there still in us of this animal? I have chosen as an answer the following utterances at large intervals of time and from men of different nationalities in order that you may see how perfectly impersonal they are; they were not called forth by any urgency of pending discussion.

Plato says in the ninth book of his Republic:

> The wild beast in our nature starts up * * * and walks about naked. * * * Even in good men there is such a latent wild beast nature which peers out in sleep

I read next from a French author of our own century, Edgar Quinet. He here uses the word sin, not in its theological meaning, but as signifying a violation of moral law. He says:

> When thou dost sin, what dost thou? Know that thou returnest to the ages of the world when conscience did not yet exist. The old nature continues to mutter at the bottom of human nature. If man makes no effort to maintain his position, he falls back among the inferior beings that preceded him, from whose midst he has emerged. By crime he precipitates himself from the summit of the scale of beings and falls below the very worm of the earth.

Is not that true? Is there a man here who does not know its truth? What have you to say about Oscar Wilde? I will not give other instances. What have you to say of such, if that is not true? What have you to say about the common expression, "If you scratch a Russian you tickle a Tartar?" Do not you all know? Does not every man here know that this civilization of to-day is a veneering; that it is a crust; that underneath all this film there are these passions, these fires? There is this brute animal nature from which we emerged, and which is still so strong in us. Now, I say, gentlemen—I say, if this is true, then any practice which tends to destroy the result of so many thousands of years of suffering, and advancement through suffering, ought to be considered very carefully before it is sanctioned. We ought to be very apprehensive, indeed, of legalizing or permitting to go unchecked any such practice, if a probable result will be the destruction of this fruit of the centuries on which our civilized life depends.

Now, I do not want to be merely asserting things; it might be said that such assertions were only my own opinions. I want to quote from men who have considered this general subject at different ages and among different peoples. Perhaps you will recollect in "Cymbeline" that the *Queen*, on one occasion, requests the court physician to procure for her certain poisonous drugs. He asks her what she is going to do with them. She answers that she wants to experiment with them upon living animals to try their beneficent or deleterious effects; not, she says, of course, on man, but on the viler animals. Shakespeare's great mind only glanced at this subject. This was the only occasion he ever touched this thing. I have been unable to find in his writings any other reference to this horrible thought of vivisection. But when Shakespeare's mind turned to that there was almost the mind of Almighty God turned to it.

What does the physician say in answer to the *Queen?* He says, first, of herself: "Your Highness shall from this practice but make hard your heart." That is what Shakespeare thought of it, and the only thing he says of it is, not that you will advance science with it, but "Your Highness shall from this practice but make hard your heart." That is the only thing you will get out of the blood and the suffering of these poor creatures, but you will surely get that—you will make hard

your heart. What else does he add? The wrong you do will not be only to yourself, "besides, the seeing of these effects will be both noisome and infectious." Now, think a moment. Of all the words in the English language can you get two which more absolutely tell what this thing is than those two—noisome and infectious? Shakespeare says the seeing of it is noisome. What does "noisome" mean? I need not tell these gentlemen, who, I suppose, all know Latin. In the tongue from which it is taken it means hurtful, but that is not the end of it—it makes hard the heart of the man who does it; it is hurtful to those who witness it; but it is something worse than that—it is infectious. You had better have about you the smallpox or the yellow fever. If there are here any of you who do these things before children in schools, you had better infect them with the smallpox and the yellow fever than do these damnable things before them, because Shakespeare says they are infectious, and you are poisoning the fathers and mothers of the coming generation.

But I have one more man whose words I want you to hear—a man who, in England the other day, wrote a phenomenal book on social evolution; who tried to show how society was making its advances slowly through this very principle of evolution. He shows, I think, conclusively, that there is inherent in society a life of its own which we can only modify to some extent; that this life goes on developing from century to century. And what does he say is the principle of this life?

The principle of altruism—of having some regard for other things higher than ourselves. He says that each generation of men make sacrifices the good of which can never accrue to that generation; they have to make these sacrifices exactly as a girl matures, marries, and goes through the pangs of maternity for the good of the race. It is an instinct in her which she can not resist; society lives and progresses only through this instinct of altruism which its members respond to.

What does Mr. Kidd say in the note at the foot of page 162 of his book on Social Evolution?

> The arguments which have been used on both sides of this question have a special interest, inasmuch as they serve to bring out in a striking light that general absence, already remarked upon, of any clear conception as to what the function of the altruistic feelings really is. The opponents of vivisection have hitherto based their case on the peculiar grounds of the alleged absence of any considerable benefit to medical science from the practice. The advocates of vivisection, on the other hand, based their case on the equally precarious ground that because the benefits to medical science have been large, obstacles should not be placed in the way of vivisection. It is evident, however, that neither side touches what is the real question at issue. If society is asked to permit vivisection, the only question it has to decide is whether the benefits it may receive from the practice through the furtherance of medical science (even admitting them to be considerable) outweigh the injury it may occasion through the weakening of the altruistic feelings it tends to outrage.
>
> The reason, however, why the question is not usually put thus simply and directly in the controversial literature which this subject so plentifully provokes, is, apparently, that we have no clear apprehension as to what the real function of the altruistic feelings is. Their immense importance is accordingly justified by instinct rather than by reason, and consequently such justification comes almost and exclusively from that section of the population whose social instincts are healthiest.

There, I say, is the verdict of a man whose book has been recognized as an epoch-making book, a man of the foremost reputation to-day in England, and I trust that his fame has, to some extent, been diffused in this country. His judgment agrees exactly with the argument which I have been urging here. Any benefit which may result from this practice is outweighed by the injury which is done to the feeling of humanity—the altruistic feeling, as he terms it—upon which social progress rests.

Gentlemen, I felt that I had to say this much in order to express my own position upon this question.

It is exceedingly important that you should have this general feeling upon the subject when you come to deal with the bill that is before you. Now, what is this bill? The bill is a concession on the part of society, so far as this District is concerned, at least, a concession that this practice may be pursued. All that is asked now by the friends of this measure is that some limit may be put upon the practice. It is asked, in the first place, that no experiments involving pain shall be permitted in the public schools, where they are poisonous and infectious. It is asked, in the second place, that no such experiments may be permitted unless they are done under license. It is admitted that they may be done for the sake of scientific experimentation. It is admitted that they may be done for the detailed purposes mentioned in the bill, and all that is asked is that they may not be done indiscriminately; that they may not be done by unauthorized persons; that they may not be done in improper places.

I am at a loss to conceive what arguments can be urged against this bill as it is. If I were speaking in favor of a bill absolutely prohibiting this practice, and it were retorted upon me that there were benefits derived from this practice of vivisection of animals which could not be derived in any other way, I should reply that those are benefits which can not be bought at the price which we must pay for them. Benefits might be derived from the dissection of criminals. It may be that idiots could be devoted profitably to a scientific purpose, but so far there is a repugnance in the human mind to cutting up even an idiot alive. I do not believe that anyone has yet proposed to cut up live idiots, but I do say that if we destroy pity, which it took thousands of years to develop, we have much to fear from the cruelty of a man who has brain but no heart. It is so hard to climb. It is so easy to fall.

It is only this century which has begun to appreciate what torture means. The lawyers on this committee will recall that it is only within this century that legal torture has been abolished. In England a form of punishment for treason, which protracted life in order that the final taking away of it might be more painful, continued to be inflicted until this century. In 1787 Lord Erskine arose in the House of Lords to advocate a bill designed to prevent the infliction of suffering as a means of punishment. He was laughed at by that foremost legislative body of Europe when he undertook to say that the torture of animals was a thing to be avoided as an evil. From that day to this there has been great advancement. Whatever position the man of to day occupies above the position he occupied at the beginning of this century is due to the fact that there has been developed a feeling of humanity which never existed before. The fact that all the countries of this world have been brought together by means of the steamship, the railroad, the telegraph, and the cable but emphasizes the truth that all members of this human family are brothers. If you want an example of that you have only to turn to the public sentiment which has developed lately in favor of the Armenians.

I will not consider how in the development of the race we came to the position that the infliction of torture is an evil. I say it is a fact which we all admit; it is a fact that the founders of our Constitution admitted when in the eighth amendment they said that cruel and unusual punishments should not be inflicted. To-day the man who advocates the infliction of torture has to maintain that proposition against public sentiment. We all know that in ancient times it was

permitted to vivisect men. I have read that even in the last century criminals were given over by the authorities for the purpose of vivisection. Who would propose to do that to-day? If it was proposed to-day by anyone in this country to vivisect a man, with his own consent even, you gentlemen can imagine the public sentiment that would be aroused. Now, the only thing that can be said with respect to the difference between torturing a man and torturing animals is this: It is said that if you torture animals it is only doing that which comes to them in the ordinary course of their lives. They rend and tear each other, and when they become sick are left by their companions to die. They do die, finally, in solitude and hunger.

To show how feeble that argument is, you have only to take the Indian. Each one of these facts exists with respect to man, as they exist with respect to animals. What attention would you give to a man who said that the right to torture man existed on account of those facts? If you can not justify the torture of man from the fact that among the savages these evils come to him, how can you justify the torture of animals by reason of the same facts?

You may ask me what right I have to assume that these things are being done every day. I have the right to assume it in the highest degree, because when we introduce a bill intended to put this thing under control of the law, the Surgeon-General of the Army of the United States comes here to oppose it, and the leading representatives of the medical societies of the District of Columbia come here to oppose it. We come here favoring the passage of a bill which simply seeks to put torture under the control of the law; that is all—not to say that it shall not be done. We do not believe that anyone who calls himself a scientist should be allowed, with absolute immunity and under no control, to do these things which I believe no man can think of for a moment without having his blood curdle. I have the right to assume that that is a great evil from that very fact.

I pick up any book on physiology and what do I see? I see records of experiments where they take any principal nerve in the structure of an animal and trace its path to the brain, and try to localize it in some particular part of the brain. If you want to know what this is, read the latest German book on the subject, translated into English. It is in what we to-day call psychology that you will find those experiments which involve the most torture. Dr. Leffingwell may have occasion to speak on that point. I can not do so, save to say that one experiment referred to in every book on anatomy is this: They take a large quadruped, such as an ass, a horse, or a dog, securely fasten the animal, and cut down to the spinal column. Then with a mallet and chisel they cut away the spinal column until the spinal cord itself is uncovered, when with a needle or knife they prick that substance which is so sensitive that its culmination in the *medulla oblongata* is the very seat of life. I say you have these men doing that to animals here in this District. I observe the doctors smile. I should like, if I had time, to call your attention to their text-books and to read here an account published by themselves—that is, by a man in their own profession, a doctor in Vienna. He takes an animal and cuts into the spinal column and then drives a wire probe through the spinal cord. These are experiments that you can read in any book on physiology or psychology.

If any of you have had the nerve of a tooth killed, you can have some very meager idea of the excruciating pain attending those experiments upon nerves. Doubtless you remember how, even after the nerve had been deadened with cocaine, when the dentist put his instrument into the cavity what pain there was. What must it be when the nerve

is not deadened? And these experiments I have referred to are not on small nerves such as are found in a tooth, but upon the spinal cord itself.

I say, gentlemen, these things ought to be regulated by law. Why should they not be? We are met, first, by the assertion on the part of these gentlemen that scientists propose to-day to take up the position from which theology has been driven. They say, "Because I call myself a scientist, my conscience is supreme; let me torture as I please; let science protect me in every iniquity that I may conceive." I say, gentlemen, that that claim was driven out of the world by the French revolution in the first place, and by the American Constitution in the second place.

In Jersey City there was a doctor who stretched iron bars across the floor of his room and then took a number of dogs and dropped them down so that they would strike on their spinal columns against the iron bars. A leading medical journal of England, in commenting upon that experiment, described it as fiendish and atrocious. Now, are we to assume that that man is a unit—is only one? Even if he is the only one, is he to be allowed to go on?

Now one other thing. It is proposed by the Surgeon-General of the Army of the United States that you gentleman shall pass a law for the United States, and in that same law shall say that its servant and those under him are to be exempt from the operations of that law. He would conduct a little shop of his own down there—a United States shop in which United States law shall not apply. The Surgeon-General of the Army has no more right to practice torture than I have. I do not know of any law in this District that does not apply to the Surgeon-General's Office as well as to the Halls of Congress. I can not kill a man here in this Capitol without being liable for it. Why should he be exempt from the law?

Senator GALLINGER. You have consumed twenty-two minutes, Mr. Perry. Whom do you desire to follow you?

Mr. PERRY. Mr. Crammond Kennedy.

Senator GALLINGER. Mr. Kennedy, whom do you represent?

Mr. CRAMMOND KENNEDY. I represent the friends of this bill, just as Mr. Perry does.

Senator GALLINGER. Do you live in this city, Mr. Kennedy?

Mr. KENNEDY. Yes, sir; I practice law here.

Mr. PERRY. You understand, gentlemen, I am not here in a professional capacity. I am not here as a lawyer, but as a citizen.

Mr. KENNEDY. If it please you, Mr. Chairman and gentlemen of the committee, I want to read a statement of Mr. Henry B. F. Macfarland, who was appointed a member of the committee of three by the Commissioners of the District of Columbia to prepare a bill for the regulation of vivisection. Mr. Macfarland's statement is as follows:

STATEMENT OF HENRY B. F. MACFARLAND, MEMBER OF THE COMMITTEE OF THREE APPOINTED BY THE COMMISSIONERS OF THE DISTRICT OF COLUMBIA TO PREPARE A BILL FOR THE REGULATION OF VIVISECTION IN THE DISTRICT OF COLUMBIA.

GENTLEMEN OF THE COMMITTEE: After the public hearing upon the McMillan-Henderson bill for the further prevention of cruelty to animals in the District of Columbia, the Commissioners of the District of Columbia, satisfied that some measure of that sort embodying the principles of restriction and official inspection of vivisection should be

enacted into law, requested Surgeon-General George M. Sternberg, United States Army, Dr. William C. Woodward, health officer of the District of Columbia, and myself to act as a committee to consider the McMillan-Henderson bill and report what modifications, if any, should be made in it as the basis of their report to Congress, the bill having been referred to them by Congress for a recommendation.

I accepted the invitation and endeavored in good faith to carry out the design of the Commissioners. The committee held two meetings, at both of which the other two members of the committee occupied the position that no legislation on the subject was desirable or necessary. At the first meeting they contended that the Commissioners had appointed the committee, not to prepare a bill, but to consider whether any legislation was necessary and desirable, and took the stand against it which they held throughout the consideration of the matter. The Commissioners of the District of Columbia, being asked after the first meeting of the committee to restate their purpose, did so, stating that they desired the committee not to investigate the subject generally, but to consider and report upon the McMillan-Henderson bill. I then endeavored, but without success, to get my colleagues to take up the bill, section by section, and propose amendments to it. They insisted, however, that there was no occasion for such legislation, and that they could not and would not take part in its preparation, and finally we agreed to disagree, and to submit individual reports to the Commissioners of the District of Columbia. Accordingly my colleagues submitted protests against the proposed legislation, and I submitted the McMillan-Henderson bill with certain modifications.

The Commissioners adopted none of the reports, but reported in favor of the McMillan-Henderson bill with certain amendments, which, if adopted, would seriously impair its value. The Commissioners evidently intend to recommend the principles of the bill, but the amendments they suggest, if adopted, would make those principles inoperative as to the most important purposes of the bill. For example, their amendments do away with the requirement for the use of anæsthetics in any case, and also exempt from the purview of the measure all the Government laboratories, where it is conceded most of the vivisection practiced in the District of Columbia is carried on.

The modifications in the McMillan-Henderson bill proposed in my report to the Commissioners contain all the concessions which the opponents of this legislation can reasonably ask. I availed myself in preparing them of all the objections which were made at the public hearing before the Commissioners, and by my colleagues in the two meetings of the committee of three, and they are the utmost that can be granted without yielding the principles of the bill or making them ineffective.

The first modification limits the application of the measure to "vertebrate" living animals, instead of including all living animals as in the McMillan-Henderson bill.

The second modification exempts from the requirements of license and registration all duly authorized medical officers of the Government of the United States, or that of the District of Columbia, and the official laboratories in which they work.

The third modification exempts from the requirements that anaesthetics shall be employed in all cases: first, so-called inoculation experiments; second, tests of drugs and medicines; third, experiments in recovery from cases of surgical procedure. These three exemptions cover all the classes of vivisection which are admitted by the vivisectors

to be carried on in the District of Columbia. If it is true, as they claim, that no other classes of vivisection are practiced here, they ought to be entirely satisfied with the exemption of these cases from the requirement that anaesthetics shall be employed. Nor can they reasonably object to the requirement that anaesthetics should be used in cases of more painful experimentation, if it should be discovered that they now exist here or if they should be hereafter introduced.

The fourth modification simply provides that no license for vivisection shall be issued to anyone under 25 years of age who is not a graduate of a medical school.

The fifth modification provides for reports to the Commissioners of the District of Columbia by licensed vivisectors on the methods employed by them in their experiments, as well as their results.

The sixth modification vests the appointment of the inspectors of vivisection provided for in the bill in the President of the United States instead of the Commissioners of the District of Columbia, and omits the requirement that one of them shall be a member of the Washington Humane Society. This is intended to meet, and it is believed does fully meet, the objections raised, first, that Government officers ought not to be subjected in their vivisection work to the supervision of inspectors appointed by the municipal officers of the District of Columbia; and second, that none of the inspectors should necessarily be taken from the membership of the Washington Humane Society. The Government officers (already exempted by the second modification from the requirement of license and registration on the ground that their official status attests their character and competency, and that the location of the Government laboratories is well known) can not certainly object to the inspection of their work by inspectors appointed by the President of the United States, who is the official superior of all Government officers, and who would doubtless appoint as inspectors men of similar standing to that of those who are appointed as members of the Board of Indian Commissioners or the Boards of Visitors to West Point and Annapolis, who serve, like the inspectors contemplated in the bill, gratuitously, and as a matter of public duty. Unless the vivisectors connected with the governmental service are to be considered above the law, or a law unto themselves, in this matter, no valid objection can be raised to placing their work under the same official inspection as that provided for similar work by private individuals. In view of the fact that Congress has created and maintains by annual appropriations the Government laboratories in which their work is carried on, as well as the offices that they themselves hold, no argument is needed to show that they are entirely under the control of Congress.

If the bill as modified in the draft submitted by me to the Commissioners should be adopted, vivisection could be carried on in the District of Columbia (except in the public schools where it is forbidden) by private persons, licensed by the Commissioners of the District of Columbia, in places registered by the Commissioners of the District of Columbia, and by duly authorized medical officers of the Government of the United States, and that of the District of Columbia in governmental laboratories under the requirement that in experiments on vertebrate living animals the subjects shall be under the influence of anæsthetics, except in the cases of so-called inoculation experiments, of tests of drugs and medicines, and of recovery from surgical procedure, licensees to report to the Commissioners of the District of Columbia their methods and results, and all vivisection to be subject to the inspection of four inspectors, to be appointed by the President

of the United States, to whom they shall report, and who shall make their reports public. The bill as thus modified would not interfere with any of the vivisection now admitted to be carried on in the District of Columbia, but would provide for the detection of any more painful experimentation, if such is being practiced here (and that fact can only be ascertained by official inspectors visiting places of experiment at unexpected times), or of such more painful experimentation, if not now practiced, but hereafter introduced. The present vivisectors may be as humane as they claim to be to-day (although this can only be determined by official inspection), but they may become less humane to-morrow, and their successors may practice cruelty. Nothing but official inspection by disinterested persons visiting laboratories, when they are not expected, can give the supervision absolutely required.

STATEMENT OF MR. CRAMMOND KENNEDY.

Mr. KENNEDY. I desire to state in the interest of both sides of this question that I have been instructed to say by the friends of this bill that they are willing to have it amended so as to exclude inoculation. I desire to state this so that it may not be necessary to discuss that phase of the bill. It may save a great deal of time not only to our medical friends but also to ourselves. We have been told that vivisection includes inoculation, and in order to do away with that objection we have submitted to the amendment.

Mr. PERRY. Mr. Chairman, there is one subject upon which I had not time to touch, but which I would like to mention. It is left in the power of the experimenter to say whether he shall give chloroform or not.

Mr. KENNEDY. As a lawyer, I must express my concurrence with what Mr. Perry says in regard to the Surgeon-General. The idea that because he is in the service of the Government in the capacity of a physician—for which he is paid—he should not be subject to supervision in making experiments upon living animals, that he should be outside the purview of the law in what he is engaged in doing—I do not want to use a harsh word—but that strikes me as monstrous.

We have here printed a bill which is the result of the conferences and the consideration given by our representative, Mr. Macfarland, in the meetings to which he has referred in his report. The committee will find this amendment on the second page of the bill, in section 2, paragraph (*b*) after the word "mentioned" add the following: "or by a duly authorized officer of the Government of the United States or of the District of Columbia." Also amend paragraph (*c*) so that it shall read as follows:

(*c*) The animal must, during the whole of the experiment, be completely under the influence of ether or chloroform sufficiently to prevent the animal from feeling pain, excepting only that in so-called inoculation experiments or tests of drugs or medicines, the animal need not be anæsthetized nor killed afterward, nor in tests of surgical procedure need animals be kept completely anæsthetized during the process of recovery from the surgical operation. Otherwise than this the animal must be kept from pain during all experiments; and

Then, in section 6 on the fourth page of this bill, in order to meet the objection of the Surgeon-General and his associates, that their experiments as Government officials upon animals, of whatever kind they may be, ought not to be subject to the inspection of the Commissioners of the District of Columbia, we have consented to amend the bill so as to place the power of attending experiments and making inspection in the

hands of the President of the United States. The amendment reads this way:

SEC. 6. That the President of the United States shall cause all places where experiments on living vertebrate animals are carried on, in the District of Columbia, to be, from time to time, visited and inspected without previous notice, for the purpose of securing compliance with the provisions of this act; and to that end shall appoint four inspectors, who shall serve without compensation, and who shall have authority to visit and inspect the places aforesaid, and who shall report to the President of the United States from time to time the results of their observations therein, which shall be made public by him.

Now, that word "vertebrate" is inserted at the beginning of the bill to obviate another objection—a proper objection, in my opinion—which was made to the bill in its original form.

Senator GALLINGER. In line 3?

Mr. KENNEDY. Yes, sir.

Senator GALLINGER. Just at this point may I ask a question? Have the amendments which Mr. Macfarland has suggested been accepted by the parties whom you represent?

Mr. KENNEDY. Yes, sir. How much time have I, Senator?

Senator GALLINGER. Twelve or thirteen minutes.

Mr. KENNEDY. I want to read, if you please, a portion of the report which the commission to which my friend, Mr. Perry, alluded, made to Parliament. Now, it will be clear to the committee, from the names of the gentlemen who were charged by Parliament with this investigation and report, that it could not have been in more competent hands. The commissioners were the Right Hon. Viscount Cardwell; the Right Hon. Lord Winmazleigh; the Right Hon. W. E. Forster, M. P.; Sir J. B. Karslake, M. P.; Prof. Thomas H. Huxley, John Eric Erichsen, esq.; Richard Holt Hulton, esq. Before that commission, in the thoroughgoing way in which such matters are handled by the mother country, there appeared hundreds of distinguished physicians and surgeons who were carefully examined in regard to vivisection as practiced in Great Britain and on the Continent of Europe.

Senator GALLINGER. Mr. Kennedy, will you please tell the committee the date of that report?

Mr. KENNEDY. The date is January 8, 1876, and it is coincident, or almost coincident, with the passage of the act to which my friend, Mr. Perry, alluded as having been law in England for the past twenty years.

Senator GALLINGER. Was that a unanimous report, or were there two reports made?

Mr. KENNEDY. The report was unanimous, except that Mr. Richard Holt Hutton made a report of his own, concurring in the report of his colleagues, but going further than they went in certain particulars. In the interests of humanity he held that, on account of the close relations between man and the household animals—the dog and the cat—those animals should be exempted altogether from experiments of this kind. I say fireside friends, for in most houses in England the dog lies on the mat before the fire, and it is said the only person who ever disputed a chair with Her Majesty was Her Majesty's favorite greyhound.

In the highlands of Scotland this sometimes happens: A shepherd is out on the mountains and a snow squall ripens into a three-days' storm. The shepherd seeks shelter, leaving his faithful dog to care for the sheep. By some divine instinct—I mean if you doctors believe in God—by some divine instinct the dog that the shepherd leaves on the hills watches over the sheep; if it is springtime he does

not lose a single lamb. In one case 500 sheep with a few early lambs were left with one collie, and after a three days' storm the shepherd found every one of them on the lee side of a precipice, not one lost—not even one of the lambs. If you were to talk to that shepherd about vivisecting his collie he would tell you to go to the hottest place outside of heaven.

Senator GALLINGER. That must be Washington to-day.

Mr. KENNEDY. Now, gentlemen, a sentence or two from this report. These doctors do not seem to know that there is a thoroughly defined scientific opposition to vivisection. Some of the greatest living physicians and surgeons are not in favor of restricting vivisection but of abolishing it.

Lawson Tait has published a pamphlet in regard to the uselessness of vivisection, in which he discusses the subject with his usual thoroughness. If there is no objection I would be pleased to make this pamphlet a part of my remarks.

Senator GALLINGER. The committee will be glad to have the pamphlet of Professor Tait to consult.

Mr. KENNEDY. The title of the pamphlet is "The Uselessness of Vivisection as a Method of Scientific Research." It is by Lawson Tait, F. R. C. S., etc. The paper was read before the Birmingham Philosophical Society, April 20, 1882, and has been reprinted from the society's transactions by the Victoria Street Society for the Protection of Animals from Vivisection, which society has united with the International Society for the Total Suppression of Vivisection. The offices of the latter society are 1 Victoria street, London, England. I mention these facts so that anybody who desires to verify the reference may be able to do so. Dr. Tait's statement is as follows:

I need not go into the general history of vivisection, for it hardly bears upon the question to which I desire to limit myself; but I think it advisable to formulate a a few preliminary conclusions before I come to my immediate subject, in order that I may clear the way for discussion and show at once the grounds upon which I stand, for I find myself in a position adverse to the view adopted by the great majority of my professional brethren.

I dismiss at once the employment of experiments on living animals for the purpose of mere instruction, as absolutely unnecessary, and to be put an end to by legislation without any kind of reserve whatever. In my own education I went through the most complete course of instruction in the University of Edinburg without ever witnessing a single experiment on a living animal. It has been my duty as a teacher to keep myself closely conversant with the progress of physiology until within the last four years, and up to that date I remained perfectly ignorant of any necessity for vivisection as a means of instructing pupils, and I can find no reason whatever for its introduction into English schools, save a desire for imitating what has been witnessed on the Continent by some of our most recent additions to physiological teaching. In Trinity College, Dublin, the practice has been wholly prevented, and on a recent visit to that institution I could not find, after much careful inquiry, the slightest reason to believe that any detriment was being inflicted upon the teaching or upon those taught.

The position of vivisection as a method of scientific research stands alone among the infinite variety of roads for the discovery of nature's secrets as being open to strong prima facie objection. No one can urge the slightest ground of objection against the astronomer, the chemist, the electrician, or the geologist in their ways of working, and the great commendation of all other workers is the comparative certainty of their results. But for the physiologist working upon a living animal there are the two strong objections—that he is violating a strong and widespread public sentiment, and that he tabulates results of the most uncertain and often quite contradictory kind.

I do not propose to deal with the sentimental side of the question at all, though no one can doubt it is a very strong element in the case as maintained by public opinion. I shall deal simply with the inquiry: Has this method of scientific research—vivisection—contributed so much to the relief of suffering or to the advance of human knowledge as to justify its continuance in spite of the manifest objections to it? My own answer I shall try to give in the following pages, merely premising that an answer to justify vivisection must be clear and decisive, must be free from doubt of

any kind, and, above all, it must not assume the protection of a "privileged mystery." This is a question, I maintain, which can be discussed by an educated layman just as well, perhaps better, as by a physician or a surgeon or a professional physiologist. It is a question chiefly of historical criticism, and we must have a conclusive answer concerning each advance which is quoted as an instance, how much of it has been due to vivisectional experiment and how much to other sources, and this amount must be clearly and accurately ascertained. It will not do, as has been the case in many of the arguments, to draw such a picture as that of an amputation in the seventeenth century and one performed last year, and say that the change is due to vivisection. We might just as well point to the prisons of the Inquisition and then to one of our present convict establishments and claim all the credit of the change for the fact that our judges wear wigs. The real questions are: What advances in detail are due to vivisection? Could these advances have been made without vivisection? If vivisection was necessary for elementary and primitive research is it any longer necessary, seeing that we have such splendid and rapidly developing methods in hundreds of other directions? Have we made complete and exhaustive use of all other available methods not open to objection? And, finally, are the advances based upon vivisection of animals capable of being adapted conclusively for mankind, for whose benefit they are professedly made?

It must be perfectly clear that to answer all these questions specific instances must be given, and that they must be analyzed historically with great care. This has already been done in many instances, and I am bound to say, in every case known to me, to the utter disestablishment of the claims of vivisection.

Take the case of the alleged discovery of the circulation of the blood by Harvey, and it can be clearly shown that quite as much as Harvey knew was known before his time, and that it is only our insular pride which has claimed for him the merit of the discovery. That he made any solid contribution to the facts of the case by vivisection is conclusively disproved, and this was practically admitted before the commission by such good authorities as Dr. Acland and Dr. Lauder-Brunton. The circulation was not proved till Malpighi used the microscope, and though in that observation he used a vivisectional experiment his proceeding was wholly unnecessary, for he could have better and more easily used the web of the frog's foot than its lung. It is, moreover, perfectly clear that were it incumbent on anyone to prove the circulation of the blood now as a new theme, it could not be done by any vivisectional process, but could at once be satisfactorily established by a dead body and an injecting syringe. In fact, I think I might almost say that the systemic circulation remained incompletely proved until the examination of injected tissues by the microscope had been made.

But supposing we grant, for the sake of argument, that such an important discovery had been made by vivisection, and by it alone, there still remains the all-important question, Is it necessary to use such mediæval methods for modern research? No one can doubt that the rude methods employed in Charles the Second's reign for obtaining evidence—the rack, the boot, the thumbscrew, and the burning match—were occasionally the means of accomplishing the ends of justice, but need we go back to them now? The very necessity for ending them brought into use fresh and far less fallible methods, and I am inclined to make the claim for physiology, pathology, and the practice of medicine and surgery that the very retention of this cruel method of research is hindering real progress, that if it were utterly stopped the result would certainly be the search for and the finding of far better and more certain means of discovery. To urge its continuance on the ground that it was useful in the seventeenth century is just as reasonable as to ask the astronomer to go back to the cumbrous tackle by which Huyghens first worked his lenses.

If the method of obtaining evidence by torture was occasionally successful, there can be little doubt that as a rule it failed and led the inquirers astray. So I say it has been with vivisection as a method of research; it has constantly led those who have employed it into altogether erroneous conclusions, and the records teem with instances in which not only have animals been fruitlessly sacrificed, but human lives have been added to the list of victims by reason of its false light.

Those who have recently advocated vivisection seem to have forgotten or to have ignored this most fatal objection, and as a rule they have indulged in a line of argument which is little more than assertion. For the purpose of this paper I have gone carefully over a large mass of literature upon the subject, and find that the bulk of it is altogether beyond criticism, because it does not deal with fact. Thus in a recent address on the subject by Professor Humphry, of Cambridge, there is a long list of advances in medicine and surgery, every one of which is attributed to vivisection solely because some experiments were mixed up in the history of each instance; but not an effort was made to show that the advances were due to vivisection. The proper method for the discussion of this subject is to take up a number of special instances and to subject them to careful criticism, chiefly by historical evidence, and as soon as the advocates of vivisection do this successfully I am prepared to grant their case. But hitherto they have failed.

Serial literature during the last few months has been singularly fertile in articles on the question of vivisection, and one commanding attention as an editorial is to be found in Nature of March 9.

There the a priori argument for the vivisection is put in the familiar illustration that "it would be more reasonable to hope to make out the machinery of a watch by looking at it than to hope to understand the mechanism of a living animal by mere contemplation." Unfortunately there is a fault in the analogy, and it may be far more truly put in the converse, that it would be wholly impossible to repair the damaged movements of a watch by experimenting with an upright pendulum clock. There is a perfectly parallel dissimilarity between the functions and the diseases of animals and those of man.

In the same article is a quotation from the article of Sir William Gull, to the effect that the experiments of Bernard, in baking living dogs to death in an oven, have opened the way to our understanding the pathology of fever. In zymotic diseases the elevated temperature is not a cause of the disease but its consequence, and the answer to the argument is that not a single contribution of any kind has yet been made to the cure of scarlet fever. Its course can not be shortened by one hour. Medicine is powerless for the cure of zymotics, while hygiene is all powerful in their prevention, and the medicine of the future lies wholly in this direction. Drugs are impotent, but sanitary laws can and will banish all these diseases when they are completely understood and fulfilled.

The article continues that "between 1864 and 1867 seven new drugs were added to the pharmacopœia, of which at least the two most useful, carbolic acid and physostigma, are due to vivisection." Upon the question of new drugs I can speak only with great reserve, for such a wholesome scepticism concerning drugs has been introduced by the medical schism of homeopathy that I look upon all new drugs with great suspicion. Sir William Gull himself says he has not much belief in drugs. I fear most new drugs do more harm than good; some of them, such as chloral, most certainly have done so. I can not learn that physostigma is of any practical service, and I have shown in my published writings that carbolic acid has done far more harm than good. Perhaps it would have been better if we had never heard of it. The question of the investigation of the actions of drugs by experiments on animals, I have to confess, is a very difficult one, because after we have found out what they do in one animal we find that in another the results are wholly different, and the process of investigation has to be repeated in man. Not only so, but in human individuals the actions of drugs in very many cases vary so much that each fresh patient may form really a new research. Pharmacy forms, therefore, at least, a very shaky argument for vivisection.

Finally, the editor of Nature deals with the argument of proportion, which is stated to the effect that the proportion of pain inflicted by vivisection bears but a small ratio to the pain relieved by the discoveries effected in that way. But if this question be examined historically, as it must be for the sake of justness, it will be found that the argument is all the other way. To take the case of Ferrier's experiments, if the history of the point be examined, even from the period of Saucerotte till now, the number of experiments recorded is perfectly awful, and we can easily imagine that many more were performed and not put on record. Concerning the arteries this is still more true; and it is, to say the least of it, very doubtful if any permanent good has been done by them. What we do really know about both of these matters with certainty has been derived from the post-mortem examinations of our failures in human subjects and not from vivisection experiments.

In a work published within the last few weeks by a distinguished member of this society, Dr. George Gore, entitled "The Scientific Basis of National Progress," and at page 80 will be found the following sentence:

"The antivivisection movement is but one of the phases of the ever-existing conflict between the advancing and retarding sections of mankind."

I do not know whether I belong to the antivivisection movement or not, but I certainly can not rank myself with those who attribute to vivisection the merit which distinctly belongs to other causes. So far I am an antivivisectionist most thoroughly.

Similarly, I do not know whether or not I am to be regarded as belonging to the "retarding section of mankind." If I am so classed I fear I shall be in company as strange to me as I shall be objectionable to it. But my relief is great as I read further in Dr. Gore's book and see upon what grounds he has built his conclusion. I have never heard that Dr. Gore has conducted any vivisection research himself, and therefore I assumed that he took his argument from some other source. He was kind enough to give me his reference for the following statement, which he makes at page 81:

"Ferrier's comparatively recent vivisection experiments have already enabled medical men to treat more successfully those formidable diseases, epilepsy and abscess of the brain."

His authority is an anonymous article in the British Medical Journal of November 19, 1881, in which a series of cases is given in support of this extraordinary

statement. The purport of it is that the experiments of Ferrier have led to greater certainty in applying the trephine for the removal of depressed fractures, etc., which had produced serious symptoms, or for the relief of matter in cerebral abscesses.

I do not propose now to go into this very wide and difficult question, because I shall have a fuller opportunity on another occasion. I shall only say that Ferrier's first experiments were published in 1873, and that previous to that time a large number of cases are on record where the seat of injury was ascertained with perfect accuracy by simpler and less misleading methods—in one case by myself in 1868. The a priori difficulties in the application of Ferrier's conclusions are enormous and, as it seems to me, insuperable; and, after a most careful historical consideration of the illustration quoted by Dr. Gore, my verdict is most decidedly that of not proven.

The application of the trephine for the treatment of epilepsy is, of course, absolutely limited to cases where the disease is the result of injury to the skull. No one has ever dreamed of applying it to other cases. I find that the first operation of this kind was performed in 1705 by Guillaume Mauquest de la Motte with partial success, and it was repeated with complete success by Mr. Birch, of St. Thomas's Hospital, in 1804. Between 1804 and 1865 there are 50 cases on record (collected by Dr. James Russell, British Medical Journal, 1865), and of these 44 recovered, the results being satisfactory in 39 of them. This paper of Dr. Russell's was published years before any of Ferrier's experiments were undertaken, and the results of trephining for epilepsy published since are not so good as those published by Dr. Russell. The most recent contribution to the subject is a paper by Mr. J. F. West, who asks the question, "Are our indications in any given case, either of paralysis or epilepsy, sufficiently precise and well marked to warrant us in recommending the use of the trephine at a particular point of the skull?" And he answers it thus: "It will be a long time before it is definitely settled, but such cases as those alluded to give encouragement." This answer of a practical surgeon is very different from that of Dr. Gore.

Even if the conclusions which are attributed to Dr. Ferrier's researches were to be regarded as indisputable, my answer would be that they might have been arrived at, and certainly would soon be enormously extended, if our clinical research were conducted upon reasonable and scientific principles. The chief reason of the slow advance of the arts of medicine and surgery is the reckless waste of the material so plentifully supplied by disease, and the first remedy will consist in the subdivision of the labor, a remedy against which, unfortunately, the medical profession protests most vigorously.

It is of course perfectly impossible to deal with all of the illustrations in favor of vivisection which have recently been advanced in the limits of an ordinary paper, and I prefer to take those which deal with points of practical utility, rather than with such as have as yet only a possibility of being useful in the future. I shall deal, therefore, at present chiefly with the illustrations which have been gathered from the field of practical medicine and surgery, for in them, of course, the public see the strongest arguments. If it is publicly announced, as has been done of late very widely, that human diseases have been cured and human suffering lessened by experiments on the lower animals, the public must therein see a strong argument for vivisection. But such announcements are open to the test of historical examination, and to this I propose to subject the most important of them. I am equally open to discuss in the same way those points of less apparent usefulness, the matters of mere physiological discovery, on some future occasion, if it should arise; but as with these the only defense can be that some day they may prove of service, it is clearly best to deal first with those for which an actual and not merely a potential utility is claimed.

Those of my professional brethren who take the other side may probably complain that I have selected a lay audience for the discussion; but the answer is that by the circulation of pamphlets and by communicated paragraphs in newspapers they have already taken the initiative, and I am but meeting them on their own ground.

I am quite well aware that I am one of a small minority of my profession in my view that vivisection is useless as a method of research, but the answer I am disposed to offer on this point is that not one in a hundred of my professional brethren have ever seriously examined the question. Ninety-nine take for granted the statements of the hundredth, and he, in turn, has not gone into the matter upon that side from which alone a safe answer can be given—that of historical criticism.

The dispute, as I have already said, is not to be settled by mere statement of opinion, one way or the other; nor is it a question of authority. On the argument of authority a very singular answer has been given by the supporters of vivisection in the case of the late Sir William Fergusson, who stated in his evidence before the royal commission that in his opinion nothing had been gained for surgery by experiments on the lower animals—an opinion which I entirely indorse. During his lifetime Sir William Fergusson had heaped upon him all the distinctions which his

Queen, his country, and his profession had it in their power to bestow. He was the titular head of his profession, its most successful operator, one of its greatest anatomists, its most widely employed practitioner, its most successful teacher, the author of its principal text-book on surgery—but now, when he is dead, we are told he was not a scientific surgeon, because he did not believe in vivisection. Nobody said this in his lifetime, and so late as 1873 he was elected president of the British Medical Association, over all the profoundly scientific surgeons of the metropolis. I share Sir William's opinions concerning vivisection, and I am quite content to rank with him on that account as an unscientific surgeon.

A pamphlet has recently been published in this town on The Influence of Vivisection on Human Surgery, by Mr. Samson Gamgee, in which the proposition is set forth that without experiments on living animals "scientific surgery could not have been founded, and its present humane and safe practice would have been impossible." Mr. Gamgee supports this proposition by a series of instances which we may presume are the best and strongest he could find. These I tabulate as follows, and I shall discuss them historically in this order:

I. Treatment of injuries of the head, and the theory of contre-coup.
II. Amputation of the hip joint.
III. Paracentesis thoracis.
IV. Subcutaneous tenotomy.
V. Treatment of aneurism, ligature, and torsion of arteries.
VI. Transfusion.
VII. Abdominal surgery.
VIII. Function of periosteum.
IX. The ecraseur.
X. Detection of poison.

Mr. Gamgee tells us that the Académie de Chirurgie gave out the subject of contre-coup, and its influence in injuries of the head, as the subject for a prize competition, and that the prize was obtained in 1778 by M. Saucerotte, whose essay was based "on literary research, clinical observations, and twenty-one experiments on living dogs." He omits, however, to make any estimate of the value of the experiments on the dogs, which seems to me to be absolutely nothing; and he quite forgets to mention that the theory of contre-coup had been completely established for nearly two centuries before, and had been particularly the subject of Paul Ammannus, of Leipsic, who wrote a well-known work, De resonitu seu contra fissura cranii, in 1674, in which trepanning is recommended at the point of contre-coup, as had been practiced by Paul Barbette, of Amsterdam, thirteen years before that. The theory of contre-coup, and the fatal practices arising from it, are happily now buried in oblivion, in spite of Saucerotte's vivisection, and would never again have been alluded to but for Mr. Gamgee's unfortunate resurrection of them.

The modern verdict concerning fractures of the skull is given tersely in Mr. Flint South's words, "The less done as regards meddling with them the better," and, "A knowledge of counter fractures is quite uncertain." In fact, nothing could be more unfortunate than the selection of M. Saucerotte's experiments as an illustration of the value of vivisection, for they were performed for a purpose which was long ago recognized as futile, and in support of a practice universally condemned.

M. Saucerotte says:

"Pour établir le diagnostic des lésions des différentes parties du viscère, j'ai cru devoir prendre la voie de l'expérience et de l'observation. Ce ne sont point ici des conséquences hasardées, ce sont les resultats de faits pénible, que formeront, á ce que j'espère, un foyer lumineux, dont les rayons répondront le plus grand jour sur la pratique."

He anticipated many of Ferrier's experiments by more than a hundred years, and when he trephined the skulls of dogs and injured their brains on the right side, he found that they became somewhat feeble on their left sides, and vice versa, a fact that had been established by pathology long before. His idea of imitating the injury of contre-coup was to pass a knife right through the substance of the brain till it impinged on the inner surface of the skull opposite the trephine hole, a most absurd experiment, as the contre-coup injures at the opposite surface only, and not necessarily at all the intervening brain substance.

Reading his experiments they seem so like Ferrier's that I fancy if Dr. Ferrier had known of the existence of this essay he would have found little need to repeat its work.

Many of the conclusions of Saucerotte's experiments are eminently absurd, and, save that of the decussation of the fibers, which was known before, I can find few that have been since accepted, and those that have been he candidly avows were previously observed in cases of disease. Finally, the conclusions concerning treatment of injuries of the head which he draws from his experiments are not such as would be listened to in modern surgery, and it is certain that if they were ever acted upon they must have had results almost uniformly disastrous.

The fact is that the whole run of vivisectional experiments on the brains of animals now extending over hundreds of years, have given no sort of assistance to the elucidation of the physiology of that wonderful organ, so contradictory have been the results. On this subject Dr. W. B. Carpenter, who curiously enough has recently appeared as an ardent supporter of vivisection, says, in the seventh edition of his standard work on the Principles of Human Physiology, page 645, "The results of partial mutilations are usually in the first instance a general disturbance of the cerebral functions; which subsequently, however, more or less quickly subsides, leaving but little apparent affection of the animal functions, except muscular weakness. The whole of one hemisphere has been removed in this way, without any evident consequence save a temporary feebleness of the limbs on the opposite side of the body, and what was supposed to be a deficiency of sight through the opposite eye. * * * So far as any inferences can be safely drawn from them these experiments fully bear out the conclusion that the cerebrum is the organ of intelligence," a conclusion which surely has never been doubted, since it was first the object of the then savage club to destroy the intelligence of a foe by cracking his skull. Continuing his researches on such experiments as those of Saucerotte and Ferrier, Dr. Carpenter tersely sums up the prima facie objections to them, objections which seem to him as they seem to me, to be fatal to their utility:

"It is obvious that much of the disturbance of the sensorial powers which is occasioned by this operation is fairly attributable to the laying open of the cranial cavity, to the disturbance of the normal vascular pressure, and to the injury necessarily done to the parts which are left by their severance from the cerebellum."

Dr. Marshall Hall also pointed out long ago that injury to the dura mater is an important factor in the results obtained.

II. Amputation of the hip joint.

At page 8 of his pamphlet, Mr. Gamgee makes the astonishing statement that this operation was only attempted after it was proved safe by vivisection. The authority he has been kind enough to give me for this is a brief sentence in the preface to the ninth volume of the Mémoires de l'Académie de Chirurgie, written by the secretary-general and published in 1778.

But the first hint we get of amputation of the hip joint is from a German surgeon named Vohler, who was in practice about 1690. It is doubtful if he ever performed it on a living patient, but it is on record that he tried it on the dead body. But it was performed by M. la Croix, of Orleans, in 1748, not only on one limb, but on both limbs of the same patient, the first operation being successful and the second almost so. This was nearly thirty years before the publication of the vivisection of dogs; and there are many other cases of success previous to Mr. Gamgee's alleged origin of the operation, one being by the celebrated Ker, of Northampton, in 1773; and, as Mr. Gamgee has published a large book on amputation of the hip joint, it is surprising that he did not know something more about the history of the operation.

III. Paracentesis Thoracis.

Mr. Gamgee makes another most unfortunate selection in the case of William Hewson, who based a theoretical operation for pneumothorax upon experiments on living dogs and rabbits so long ago as 1769. He made a wound in the side of the chest and admitted air into the pleura, where no air ought to be, and then he operated to get it out again. When such a condition is brought about in man and no vital organ seriously injured, the patient gets perfectly well without any operation. I can not learn that Hewson's operation for the removal of air has ever been performed on man. When pneumothorax occurs from disease it is generally associated with conditions necessarily fatal, for which no operation is advisable. On this point the greatest authority, Dr. Bowditch, of New York, says:

"I have operated once in pneumo-hydrothorax, with temporary relief and comparative ease for several days. Many theoretical objections may be urged against the operation in such a case; but as the operation can do no harm and may give much relief, I shall operate again in such a case."

The proceeding is therefore doubtful, the conditions are extremely rare, pure pneumothorax, such as Hewson invented his proceedings for, never needs it, and therefore his experiments on living dogs and rabbits were useless.

Finally, tapping for the removal of fluid in the chest was practiced long before Hewson's time, and therefore his research was needless. Hewson really based his proposal on this well-known practice, but in this he was anticipated in the most favorable cases—those of wounds—for Anel, of Amsterdam, published quite the same proposal in 1707, and it has been uniformly condemned by every writer on military surgery since, because the removal of the air merely induces bleeding. Anel devised a syringe for the purpose, which has been revived as the modern aspirator. Had Mr. Gamgee known anything of Dominic Anel he would never have mentioned William Hewson.

IV. Subcutaneous Tenotomy.

I have traced the history of the surgery of tendons, and I can not see the slightest reason to attribute any of the advances in this department to the alleged vivisections of John Hunter. I can not find any record of these experiments, beyond the allusions to them by Drewry Ottley and Palmer in his life of Hunter.

The same accident which happened to Hunter in 1767 happened to the first Monro in 1726, and from the latter instance a very marked advance in surgical practice was at once made, and a contrivance invented by Monro himself for his own case is still in use and goes by his name. No such advance was made from Hunter's accident or from his vivisections. In their histories of the progress of orthopœdic surgery Little and Adams make no such claim for Hunter. Adams points out clearly, and with justice, that Hunter established the principles on which subcutaneous surgery is now conducted; but these he established from clinical observations, not from experiments upon animals. And in his lecture on "Ruptural Tendons" (Vol. I, p. 436), Hunter says not one word about his vivisections, or any conclusions he derived from them as to the method of repair of tendons. If he ever made any such experiments he must have placed very little value upon them.

If we trace the development of tenotomy we find that Hunter's experiments had no influence upon it at all. They were performed, it is said, in 1767. But the first tenotomy was not performed till 1784, by Lorenz, at Frankfort, and then the conditions were absolutely in defiance of the principles of subcutaneous surgery. It was done by an open wound, and this practice was continued with hardly any modification till far on in this century. In fact, as Adams points out, it is from 1831 that the commencement of scientific tenotomy dates, at the hands of Stromeyer. If this is so, and Adams makes his case out most conclusively (Club-Foot, 1873), how utterly useless Hunter's experiments on dogs must have been, to lie forgotten and unnoticed till unearthed in Mr. Gamgee's pamphlet of 1882, one hundred and fifteen years after they were performed; or how singularly careless and inattentive to the teachings of vivisection the medical profession must be that they should allow this immense discovery to lie neglected from 1767 till 1831.

To bring forward so rash an illustration as this for the value of vivisection is to cast a terrible slur at the profession of surgery, a slur which I do not think at all deserved if the true history of such advances is carefully investigated and the moving causes of them properly credited.

V. Treatment of Aneurism, Ligature, and Torsion of Arteries.

Mr. Gamgee alludes to the oft-quoted story of the Hunterian operation for aneurism as a proof of the aid vivisection has given to surgery. This illustration has been so completely and so often destroyed that it is absolutely unnecessary to allude to it further than to explain that Hunter modified Anel's operation merely because he found the artery near to the seat of disease would not hold the ligature, and the patients bled to death. As the arteries of animals never suffer from the disease in question experiments upon them could not have helped Hunter in any way whatever. Sir James Paget, who has lately appeared as an ardent advocate for vivisection, and, therefore, may be appealed to by me as a witness not biased to my view, has recorded his opinion in the Hunterian oration given at the College of Surgeons in 1877, that Hunter's improvement in the treatment of aneurism "was not the result of any laborious physiological induction; it was mainly derived from facts very cautiously observed in the wards and deadhouse." In this opinion Sir James Paget is undoubtedly correct.

Concerning the tying and torsion of arteries I am in a position to speak with some authority, because I have myself performed experiments on living animals, and have found how futile they are and how uncertain and untrustworthy are their results. Mr. Gamgee tells us that some local worthies, who were distinguished by early performances of serious operations, practiced their 'prentice hands on living animals. This is not scientific experimentation, but culpable and wholly unnecessary cruelty. It is on the dissecting table that a surgeon prepares his hand for his work, and not on the bodies of living animals. I have never known nor heard of such an instance before, and I trust there are no more to be quoted. Any surgeon who did this now would, I am sure, receive a universal condemnation from his professional brethren.

Mr. Gamgee quotes Jones's experiments on the arteries of animals as an instance of a valuable contribution to surgical progress by experiments on animals, and I do not think any more complete illustration could be quoted in support of the uselessness of vivisection as a method of scientific research than that of the history of the physiological and pathological processes to be observed in arteries. If we consider the question from what some would call the purely scientific side, that is, apart alto-

gether from any practical bearings it may have for the relief of human sufferings and the cure of human disease, it consists merely of a mass of observations in which each observer contradicts some other. Upon this subject I wrote as follows so long ago as 1865:

"John Hunter warned surgeons to avoid injuring any of the coats of an artery, and to this effect advised that the ligature should not be drawn so tight as to cut them; while many of his contemporaries and successors dreaded any injuries so much that they used all sorts of clumsy contrivances to avoid it—such as pads of lint and bits of cork inserted between the arteries and ligature. Again, Travers, in his experiments on ligatures of arteries, demonstrated that Jones was quite wrong when he insisted that it was necessary to divide the inner coats, and Mr. Dalrymple, of Norwich, proved by his experiments that while simple and continued contact of the parietes of a vessel, without the slightest wound of any of the coats, was sufficient to produce permanent adhesion and obliteration, yet that division of the internal and middle coats without continued coaptation invariably failed to produce adhesion. Hodgson says that he can not substantiate Jones's statement that division of the coats is essential, and strongly supports the opinion that coaptation of the walls, without rupture of any of the coats, will produce occlusion. The theories of Dr. Jones were strongly supported by Professor Thompson, his teacher, but were strongly opposed by Sir Phillip Crampton, who insisted that the division of the coats not only was unnecessary, but that it frequently defeats its own object." (Medical Times and Gazette, 1865.)

I quote this at length to show that fifteen years ago I found authorities differing so much on this scientific question that I thought it advisable to institute a new series of vivisectional experiments to decide it. The experiments performed by myself only added to the confusion, though nobody saw that at the time. What we were working at was to get quit of the ligature altogether, and to secure arteries by a temporary compression of some kind without injuring the coats. Acupressure promised to accomplish this, but it failed, for reasons I need not enter into here. The desire to get quit of the ligature was due to the fact that after a vessel was tied one end of the ligature was cut off and the other left hanging out of the wound, where it remained for weeks, sometimes for months, and occasionally (as in Lord Nelson's case) for years.

The amazing thing is that with all the experiments made upon animals nobody ever thought of cutting both ends of the ligature quite short and closing the wound over it. As a matter of fact, from the time of Ambrose Parè to that of Simpson, an interval of over three hundred years, we went bungling on with experiments on animals when the whole thing lay clear before us. It was the successful experiments of Baker Brown and Thomas Keith upon women suffering from ovarian tumors which showed us that if we use pure silk, cut the ends of the ligature short, and close the wound carefully over them, success will be certain. Yet, not content with this, we hear of fresh experiments on animals with carbolized catgut, chromicized catgut, kangaroo tendons, and other novelties, which speedily die out when applied to human beings.

In the case of the arteries, therefore, experimentation on animals has proved to be "science, falsely so called." What we have done in this direction is entirely the result of clinical experience, and that only.

VI. Transfusion.

This operation was not initiated, as asserted by Mr. Gamgee, in the second half of the seventeenth century by Dr. Lower, of Oxford, nor was it at first proposed as a legitimate surgical operation at all. It was proposed, and in all probability was really practised, by the alchemists of the sixteenth century as an attempt to obtain for the wealthy aged a renewal of their lease of life, after the theory and legend of Faustus. Certain it is that allusions to it are frequent, though the first actual account of its performance is given by André Libavius, professor of medicine at Halle (Helmst. 1602), as having been performed by him in 1594, the blood of a young healthy man being transfused into a man aged and decrepit, but able and willing to pay for the supposed advantage. In the early part of the seventeenth century it was a good deal discussed from this point of view, forgotten for a while, and then after the Restoration it was reconsidered, and a great deal written about it in this country and on the Continent. An extremely interesting allusion to the experiments is to be found in the wonderful Diary of Samuel Pepys:

"November 14, 1666. Dr. Croone told me that at the meeting at Gresham College to-night (which, it seems, they now have every Wednesday again) there was a pretty experiment of the blood of one dog let out (till he died) into the body of another on one side, while all his own run out on the other side. The first died upon the place, and the other is very well and likely to do well. This did give occasion to many pretty wishes, as of the blood of a Quaker to be let into an Archbishop, and such like; but, as Dr. Croone says, may, if it takes, be of mighty use to man's health, for the amending of bad blood by borrowing from a better body.

"16th. This noon I met with Mr. Hooke, and he tells me the dog which was filled with another dog's blood at the college the other day is very well, and like to be so as ever, and doubt not its being found of great use to men, and so does Dr. Whistler, who dined with us at the tavern."

The scheme of transfusion in all the experiments of the seventeenth-century descriptions of which I have seen was to take arterial blood from an animal and pass it into the veins of another, and that this was successful is not surprising. But this has never been attempted in modern times upon man. It certainly would not be justifiable; because, to interfere with a large artery—and a large artery would be required—in a man is always an extremely risky thing. Dr. Lower, who is Mr. Gamgee's authority, in 1667 injected or tried to inject arterial blood from a lamb into a man, but the operation was so badly done that I do not believe any blood really passed. If Pepys's idea could have been carried out, of transferring some of the peaceful blood from the arteries of a member of the Society of Friends, for the replacement of the turbulent and brutal spirit of Archbishop Laud, some good might have been done, much of the terrible history of that time need not have been written, and I might not have appeared here as a critic of such experiments. But no such or any other good result was obtained. A large army of experimenters rushed into the field, a fierce controversy took place; but before the eighteenth century dawned the whole thing was discredited and forgotten. Mr. Flint South gives a succinct history of the matter, and tells us that it was revived by the plan of mediate transfusion in the early part of the present century. The former experiments were fruitlessly repeated and others tried. The result is that the operation has a very insecure hold on professional opinion. I have seen it performed seven times, without success in a single instance. I have twice been asked to do it, and have declined, and both patients are now alive and well. We hear a great deal of cases in which patients have survived after transfusion has been performed, but we hear little or nothing of its failures. Personally, I have no confidence in the proceeding.

VII. Abdominal Surgery.

Mr. Gamgee alludes to a vivisection experiment made by John Shipton, and published in 1703, as having laid the foundation for the recent advances of abdominal surgery, which are attracting the admiration of the whole professional world, and the instances he quotes date so late as 1880. If Shipton's experiment has been so fertile, why has the crop been delayed for one hundred and seventy-seven years?

But even here Mr. Gamgee is wrong in his history. The whole progress of abdominal surgery dates from the first successful case of ovariotomy performed by Robert Houston in 1701. Failing to see the lesson taught by this, and led astray by vivisection, no further success was achieved till 1809, by Ephraim McDowell, and it was not till 1867 that any substantial gain was made. Disregarding all the conclusions of experiment, Baker Brown showed us how to bring our mortality of ovariotomy down to 10 per cent; and again, in 1876, Keith proved that it might be still further reduced. The methods of this reduction were such as only experience on human patients could indicate; experiments on animals could and did teach nothing, for operations have been performed on thousands of animals every year for centuries, and nothing whatever has been learned from this wholesale vivisection.

As soon as Keith's results were established abdominal surgery advanced so rapidly that now, only six years after, there is not a single organ in the abdomen that has not had numerous operations performed upon it successfully. I have had, as is well known, some share in this advance, and I say, without hesitation, that I have been led astray again and again by the published results of experiments on animals, and I have had to discard them entirely.

Speaking of some recent attempts which have been made to operate on cases of cancer of the stomach, Mr. Gamgee says:

"Warranting, as such cases do, the placing of cancer of the stomach amongst diseases curable by the knife, do they not also justify the vivisection of dogs by Shipton and Travers, who, by their experiments, laid the first scientific foundation of intra-abdominal surgery?"

Such a statement as this must be so completely qualified as to be regarded as altogether inaccurate. No form of cancer is yet known ever to have been cured, either by operation or anything else. If removed it invariably returns, and in all these cases of cancer of the stomach quoted by Mr. Gamgee, save one, the disease speedily returned and killed the patients. The one exception has not yet been under trial long enough to enable us to give an opinion. Doubtless it will have the same end as the others.

VIII. Function of Periosteum.

The history of the development of our knowledge of the formation and growth of bone is extremely interesting, because it shows how completely misleading are the conclusions based upon vivisectional experiments, and how perfectly the secrets of nature may be unraveled by a careful and intelligent examination of her own experiments. No one can look now at a necrosed bone without seeing how completely the whole story is there written. The history also exemplifies the fact that it is not only the purely practical details of surgery which are independent of vivisection for their development, but what are called the more scientific developments of physiological knowledge are equally possible without its aid, and are often retarded by its misguidance.

The first real observer in this department was Jean Guichard Duverney, born in 1648, who achieved such distinction that Peyer, in a dedicatory epistle, says to him, "Sempiterna te (Duverneyum) quondam trophœa manebunt et Regi vestro, Academiæ Urbique gloriosum erit tantum aluisse civem." He studied closely, and wrote a great deal about the anatomy, physiology, and surgery of bones, and in his books he fully describes the method of growth and ossification of bone, its dependence for its nutrition and growth upon the periosteum; the only thing he lacks is the microscopical knowledge of modern times. He also performed vivisections, not upon the periosteum but on the medulla, and they led him into most erroneous conclusions. He cut through the thigh bone of a living animal, and repeatedly plunged a stylet into the medulla, and the animal gave evidence of great suffering. The marrow, he therefore concluded, received a great number of nerves, which passed through the canals in the bone, but which existed only in his imagination. As long as he kept to his clinical observations and anatomical dissections he reached exact conclusions, but as soon as he entered the arena of vivisection he went all astray.

The next author of note was Francois Hunauld, born in 1701, who published in 1730 Recherches Anatomique sur les Os du crâne de l'homme, in which he describes with the utmost accuracy the ossification by the membranes, between which the cranial bones are developed. The only errors he made were hypothetical descriptions of things he could not have seen without a microscope, and that he evidently had not used.

Next comes Robert Nesbit, a Scotch surgeon, settled in London, who published in 1736 an essay entitled "Human osteogeny, explained in two lectures."

He was the first to demonstrate the construction of bone by the now familiar experiment of dissolving out the mineral matter, and leaving, as he most accurately says, a spongy substance altogether different from cartilage. Cartilage he referred to its proper function; but he describes it as vascular, in this showing the want of microscopical investigation: but concerning the process of ossification he had got quite as far as we have at the present day. He tells us that in the blood, or in a liquid separated from it, there is an ossifying fluid, a fluid containing the material out of which bone is built up, composed of parts whichare not sensible; that whenever nature determines upon an ossification within a membrane, from which all bones are developed or in a cartilage, she directs by some means, the nature of which we are ignorant of, a larger quantity of blood to the vessels of the membranes, so that they become distended and visible, whereas before they were invisible. He describes the process of ossification only with such errors as are due to the absence of the microscope, and says: "Thus the membranes (periosteum) and the cartileges are the reservoirs in which the osseous particles are deposited and molded." He denied the existence (and quite correctly) of an internal periosteum which had become about that time a matter of great contention.

The celebrated discovery of the property of madder for staining growing bone, when used as food by animals, was published by John Belchier in the Philosophical Transactions for 1736, and he fully disclosed thereby the method of growth of bone from periosteum, and many other most interesting and valuable discoveries concerning bone.

Between 1739 and 1743 Henri Louis Duhamel-Dumonceau published eight memoirs on the growth and repair of bones, largely based on the suggestive discovery of Belchier. Up to this time the formation of callus was thought to be due to an effusion of osseous juice—a belief which pervaded the surgical teachings of a distinguished professor of the University of Edinburgh so late as my own student days—but Duhamel proved its real origin. He also completely established the fact that bones grow in thickness by the addition of osseous layers originating from the periosteum.

Duhamel performed many vivisections, but it is quite clear from his own descriptions that they were failures and did not help him. He says himself that his conclusions were based on sections which he made of specimens of fractures which were in the collections of Winslow, Moraud, and Hunauld. In fact, to any intelligent observer who looks at a preparation of necrosis it is evident that no vivisection was needed to show the whole process and growth of repairs of bone; and, even if

vivisection were necessary, history displays with certainty that Syme and Ollier, to whom Mr. Gamgee attributes the merit of these discoveries, were only uselessly repeating the attempts of Duhamel more than a century old, and were only attempting to establish what had long before been proved.

Since Duhamel's time thousands upon thousands of experiments upon animals are on record, some to prove that the periosteum has nothing whatever to do with the formation of bone or with the production of callus, and others to prove that we owe everything to the periosteum, and yet it has been settled absolutely only by the experiments of disease upon our own bodies, and not by experiments on animals. It would be really amusing to read the account of the researches of Sue, Bordenave, Delius, Dethleef, Fongeroux, Haller, and countless others, were not the humor of their mutual contradictions sadly marred by the accounts of the tortures they inflicted uselessly on myriads of animals.

The experiments of Dethleef, of Göttingen, in 1752 were far more scientific than those of Mr. Syme in 1837, and the conclusions of both seem to me to be equally erroneous. At any rate, Mr. Syme did not help us one bit in advance of Duhamel and Fongeroux. Haller made numerous vivisectional experiments, and he was the most distinguished physiologist of his time, yet he records his conclusion that the periosteum has nothing whatever to do with the formation of bone, and as a proof of this he quotes the formation of exostoses on teeth. The fact is, that as long as dependence was placed on vivisection, so long did one experimenter investigate after another fruitlessly, and with conclusions absolutely contradictory. On pathological research alone has the true conclusion been established. Haller made a long series of vivisectional experiments, published in two memoirs, and triumphantly proved that the periosteum can have nothing to do with the formation of bone. He concluded from his vast array of experiments that bone grew from the middle and not from the outside, together with many other absurdities, only to be matched in the modern researches of Bennett and Rutherford on the function of the liver, also based on fallacious vivisections.

The whole of the physiology and pathology of bone have been laid bare by the accident of the pigs of the dyer with whom Belchier dined, by microscopic research, and the observations of disease. Yet Hunter and Stanley thought it necessary to confirm the conclusions of the madder stain by such a clumsy device as fixing a ring of metal round the growing bones of a young animal, letting the ring remain for months or years, and then examining to find—what? Absolutely nothing, save that the ring had been more or less covered, just as it would have been on a tree, thus only repeating Duhamel's conclusions. Other observers bored holes in bones and filled them with metal plugs and shot to find only that the conclusions of disease, that long bones grow from the epiphyses, is absolutely correct. Then we come to Mr. Syme's paper in 1837, "On the power of the periosteum to produce new bone." Mr. Syme almost every week was in the habit of cutting through great thicknesses of new bone attached to and growing from the periosteum to get at dead old bone from which the periosteum had been separated; and the new bone, being between the periosteum and the old bone, must of necessity have grown from the periosteum; there was nothing else it could grow from. Therefore, if Mr. Syme found it necessary to cut up animals to find out what was constantly staring him in the face, he was a profoundly unscientific surgeon, whose researches were as badly conducted as they were useless.

When Mr. Gamgee read his paper at the local medical society and quoted these experiments of Mr. Syme, I said that, as far as I could recollect, the fact was that their conclusions had been absolutely upset by Mr. Goodsir, who did not make experiments upon animals, but followed a far more scientific method of research—microscopic examination. On refreshing my memory I find this is the case. In a paper read before the Royal Society of Edinburgh in answer to Mr. Syme, Mr. Goodsir shows that Mr. Syme's method of research was so bad that the experiments could not be performed accurately. Mr. Syme was preeminently an unscientific surgeon, for he knew nothing of the microscope; in fact it may be doubted if he ever looked through one. Mr. Goodsir, on the contrary, may be looked upon as the father of modern histological research. He proves conclusively that Mr. Syme's experiments were absurd in their conception and futile in their application. Mr. Goodsir's conclusions are, on the contrary, uniformly accepted, and as to his method he says that they were made upon shafts of human bones which had died—museum specimens, just as Duhamel's were. They showed that while the periosteum is the matrix and machine by which the new bone is made, the real agency is in the layer of osteal cells, and so he finally solved the riddle. He did this by microscopic and pathological research. He condemned the employment of vivisection as useless and misleading, and to him we owe the completion of Belcher's and Duhamel's research—a completion which was hindered for a century by the blunders of vivisectionists.

After this I need not stop to discuss the useless repetition of Mr. Syme's experiments, with variations by Ollier, of Lyons, for that would be merely a waste of time.

IX. The Ecraseur.

Mr. Gamgee quotes the introduction of the ecraseur as an instance of the influence of vivisection on the progress of human surgery. No more unfortunate instance could be quoted. The principle of the instrument is that it crushes and tears the tissues instead of cutting them as by the knife. The surgical aphorism that "torn arteries don't bleed" was in existence long before M. Chassaignac was born, and if he had based his employment on that alone he could have done all that his instrument has effected. But unfortunately he performed experiments upon animals, and immediately he was led astray. I once saw the leg of a favorite dog amputated at the hip joint on account of disease, and when the limb was removed not a single vessel bled, and the main artery was tied only as a matter of precaution. In the human subject I have seen twelve or fifteen arteries tied in the same operation, for with us the smallest arteries bleed and require to be secured. Our arteries act in ways altogether different from those seen in the lower animals. Their pathology and physiology are absolutely different, as may be seen in the frequency of apoplexy and aneurism with us, and the almost complete immunity from them of all the lower animals, even in extreme old age. Hunter tried his best to induce aneurism to the lower animals and failed. Injuries to arteries in the lower animals are repaired with the utmost certainty and readiness, but in man it is altogether different. It may be easily imagined, therefore, that M. Chassaignac's application of the ecraseur to the lower animals was found wholly misleading when man was the subject, and now in human surgery its utility is extremely limited; that is, it is entirely confined to operations where only very small arteries are divided. Speaking for my own practice, I may say that it might be dispensed with and never missed.

Mr. Gamgee's quotation of its application to the ovarian arteries of the cow is peculiarly unfortunate, seeing that when it was used for the same purpose in the human subject it had speedily to be given up on account of its failure.

X. Detection of Poison.

A great deal has been made of the successful experiments recently performed by the medical experts for the conviction of Lamson, for that worst of all crimes, the most unpardonable, murder by poisoning. At first sight this does seem a case in which experiments upon animals may be justified. Certainly anything and everything ought to be done to convict a poisoner, and if nothing short of that would do, I would advocate the performance of a hecatomb rather than that such a scoundrel as Lamson should escape. So late as a few weeks ago I made a reservation on this point in my condemnation of vivisection as a method of research, but it seems to me, from a closer consideration of the facts of the case, that it forms really a very strong argument for the complete abolition of vivisection, and, at the same time, unfortunately, it is a matter of grave reproach to modern science.

Fortunately the conviction of a poisoner is almost certain. If he is not a doctor he commits the crime so clumsily that he can not escape. If he is a doctor he must have an interest in the victim's death, is almost certain to be in pecuniary difficulties, and is sure to have had a bad character previous to his great crime. The only difficulty lies in the proof of the presence of the poison. With all poisons but the alkaloids this is a matter of such ease that failure is impossible, and as the alkaloids are almost exclusively in the hands of chemists and doctors the limitation of their use is very close.

The most notorious case in which an alkaloid was used, or supposed to have been used, by a poisoner was that of Parsons Cook. The alkaloid was supposed to be strychnine, and I say supposed because I rise from the perusal of that trial with much doubt as to whether Parsons Cook really died of strychnine poisoning. Certainly I can not accept it as proved, and I think if the trial were to occur now the same evidence which convicted Palmer would probably break down. I am perfectly satisfied, however, that Palmer received substantial justice.

In Palmer's case the principal witnesses for the prosecution were the late Dr. Alfred Swayne Taylor, and the late Sir Robert Christison, certainly the greatest toxicologists of this century. Strychnine was not discovered in the body of Cook, and Dr. Taylor had to admit that the best tests then known were insufficient to discover one-fiftieth of a grain, and that even half a grain might remain undetected amongst food in the stomach. Palmer was sentenced to death upon the 27th of May, 1856, and in July of the same year a method of chemical analysis was published by Copney in the Pharmaceutical Journal, by which one five hundred thousandth of a grain of strychnine could be detected with certainty after separation. In his evidence Dr. Taylor admitted that the experiments he had performed upon animals with strychnine were practically worthless for any application to man, and in the

report of the royal commission of 1876 he condemned such experiments, particularly those which are directed toward the discovery of an antidote to snake bite.

Strychnine was discovered in 1818, and was first used as a poison in 1831, and again in the case of Mrs. Sergison Smith in 1847, and it was no new matter the toxicologist had to do with in the trial of Palmer. It must be regarded, therefore, as a matter for deep regret that it was not till after the trial and execution of Palmer that the chemistry of strychnine was exhaustively examined, and definite and certain tests for it obtained. At the trial there was a sort of competition among the vivisectionists, and Serjeant Shee actually urged as an argument for the defense that his witnesses had performed ten times more experiments to prove that there was no strychnine than the witnesses for the prosecution had performed to prove what never was proved, that strychnine was used at all. Yet in two months chemical processes were devised, without the slightest aid from vivisection, which detected half a millionth of a grain with certainty.

At the trial Professor Christison said that another alkaloid was known, of a deadly poisonous character, which it was impossible to detect, but under the judge's direction he refused to make its name known. There were really many alkaloids of a deadly poisonous character at that time quite well known, and aconitine was one. The first case to bring this poison under notice as a criminal agent was in 1841, and the notorious Prichard destroyed his victims with it in 1865. Dr. Penny, of Glasgow, resorted to experiments on animals in order to bring the crime home to Prichard, and succeeded. Yet I have looked in vain for any record of a research for a method which will detect aconitine with certainty by chemical analysis, as strychnine can be detected, and Dr. Stephenson admitted in evidence that there was no such test.

I daresay such a method will be shortly published, and what I desire to point out is that this discovery ought to have been made long ago in the interest of public safety, not only with regard to aconitine, but with regard to many other alkaloids which may be used in the same way, and which can not be discriminated from aconitine, even by experiments on animals. At present when need arises we must go back to the uncertain method of experimenting upon animals. But this is not science, if by that word we are to speak of exact knowledge. The very weakness of this method has led to a serious infraction of the principles of our judicial proceedings, for the home secretary announced in the House of Commons only a few nights ago that the Government, in a case such as Lamson's, could not allow the proceedings of the medical experts for the prosecution to be watched by other experts on behalf of the defense.

This is altogether unfair, for with such an uncertain and inconclusive method as that of experimentation on animals two men, even if appointed by the colleges of physicians and surgeons, and not by the treasury, may be mistaken, whereas by chemical or spectroscopic analysis mistakes are extremely unlikely, and the more observers there are the better.

The general conclusion, therefore, is that for such purposes experiments on animals should be entirely prohibited, and that an exhaustive research should at once be undertaken at the expense of the State, upon the spectrum and chemical analysis of all substances which may be used for criminal purposes. There is no known substance of constant character which has resisted the chemists' effort to identify it when it has been properly investigated.

If all these alkaloids had been subjected to an exhaustive investigation as strychnine was after Palmer's trial, there would have been no need to revert to vivisection in order to convict Lamson, and I do not think it would now be contended as necessary for the detection of a poisonous dose of strychnine that experiments on animals should be made. Vivisection in this case is therefore not the weapon of science, but is the refuge of incomplete work.

I have now gone over all the points urged in favor of vivisection as contributory to surgical advance as given in Mr. Gamgee's pamphlet, and with the result, to my mind, of proving that in every instance the claim is groundless. Had I time at my disposal I could examine in detail numerous other claims equally fallacious. So far, indeed, as I have already said, I have not met with a single case capable of substantiation, not even the most recent—that of Pasteur's discovery of the prevention of zymotic diseases in domesticated animals by inoculation of cultivated virus.

In the Nineteenth Century for March will be found an article by a well-known veterinary surgeon, Mr. Fleming, on this subject. He describes the ravages of such diseases as anthrax, splenic fever, rinder-pest, swine plague, etc., among the animals which form our food supply, and I admit the accuracy of his statements. Quite recently Mr. Pasteur has discovered, and his statements have been amply confirmed, that the specific organisms which form the poisons of these diseases may be so artificially cultivated as to be capable of producing by inoculation a mild form of the original disease, which mild form is largely protective from the severe and fatal form of the same malady. In fact there is a perfect analogy between this discovery of Pasteur and that of Jenner.

The argument is that by their inoculation the zymotics of domestic animals may be stamped out, and the claim is that it is a great advance brought about by vivisection. But on a little examination it seems to me that both argument and claim break completely down. If it is really an advance from vivisection, then those who benefit are the animals experimented upon, and that may be legitimate enough—they at least would share largely in the benefit.

But the case must be examined from another side. There are some twenty zymotics among our domestic animals to be provided against. Are we to have each of them inoculated some ten or twelve different times, each time for a different disease? The affirmative reply possesses a strong pecuniary interest for a veterinary surgeon, but a practical man will only smile at it.

But, to go deeper into the question, we find another and a much stronger objection. Such a process as protective inoculation must always be an inefficient and a temporary measure. To take the case of vaccination and smallpox, it is beyond dispute that vaccination protects the individual to a large extent from smallpox, but it does not protect the community, as may be seen from the ravages it is making at the present time in neighboring towns and counties. The machinery of vaccination never can be so perfect as to stamp out the disease, and it must be regarded purely as a temporary expedient. The real agent for the stamping out of smallpox is the machinery of a system of sanitary police, such as we have here; and even on the small scale in which we have had it for six years it has worked marvels. It will stamp out not only smallpox, but every other zymotic at the same time, and by the same measures, and then we need not trouble about vaccination—certainly it need not be compulsory.

But the case is still stronger with the lower animals. With them, as with us, civilization has introduced zymotic poisons which are absolutely unknown to the wild animal, and the reasons are not far to seek. In my capacity as one of the managers of a large public institution, I had recently to investigate the cause of an endemic of swine plague, and I found a state of matters which had caused at the same time typhoid fever in a human patient.

Look at the arrangements of an ordinary British farmyard, and then believe that it is a matter of no wonder that rinderpest destroys the cattle and diphtheria the farmer's children. The animals spend their lives in houses not lighted and not ventilated, or walk about in a mass of seething filth, on one side of which stands the farmhouse, every room reeking with the stench of the cattle yard.

When it begins to dawn on the mind of the British public that all these diseases, both for man and animals, are absolutely preventable by the simple means of securing fresh air, pure water, and abundant light, they will be banished. Meantime inoculation may, and probably will, prevent individuals being attacked, but it will not stamp out the diseases, and it must be regarded as really a retrograde proposal when we have in our hands the means of complete prevention.

I hope I have thus made it clear that deeply as I feel the strength of the objection to the practice of vivisection upon the various grounds I indicated at the beginning of my paper, I urge against it a far stronger argument than these—that it has proved useless and misleading, and that in the interests of true science its employment should be stopped, so that the energy and skill of scientific investigators should be directed into better and safer channels. I hail with satisfaction the rousing which is evident in the public mind upon this question, and I feel confident that before long the alteration of opinion which I have had to confess in my own case will spread widely among the members of my useful profession.

Mr. KENNEDY. Sir William Ferguson, president of the Royal Academy, himself a vivisector, and said to have been one of the greatest of modern surgeons, testified that the advantages of experiments upon living animals have been greatly overrated.

Senator GALLINGER. Can you furnish the committee with the exact text of the statement of Sir William Ferguson?

Mr. KENNEDY. Yes, sir.

Senator GALLINGER. Then I wish you would leave it with the reporter.

Mr. KENNEDY. This is from the report of the royal commission on vivisection, and as Sir William Ferguson's testimony covers the entire ground of vivisection, I would be glad to have the committee read it entire. The examination of Sir William Ferguson is as follows:

EXAMINATION OF SIR WILLIAM FERGUSON BEFORE THE BRITISH ROYAL COMMISSION ON VIVISECTION.

CHAIRMAN. You are sergeant-surgeon to the Queen?—Yes.

And surgeon to King's College Hospital?—Yes.

And a fellow of the Royal Society?—Yes.

Has your attention been drawn to the subject which this commission has been appointed to consider?—Yes; it has.

Have you had much personal experience about it?—A great deal in my earlier life.

Not so much latterly?—Not so much latterly.

What is your opinion, generally speaking, upon the subject as to its necessity or utility?—I have an idea that a great deal that has been done has been of service in regard to physiology and human knowledge, but that it has not been of that immense value to human nature that some claim for it.

Are you of the opinion that there has been recently a great development of the taste for this sort of investigation?—Yes; I am impressed with that opinion.

And are you of opinion that that taste has been accompanied by a corresponding amount of utility?—No; I doubt if there has been a corresponding amount of utility.

Now, are experiments which involve suffering carried to a greater extent than they need be?—I think so.

In what respects?—There is continued and, in my estimation, useless repetition. When once a fact which involves cruelty to lower animals has been fairly recognized and accepted, it seems to me that there is no necessity for a continued repetition of experiments to display that fact.

When an experiment has once decided a question, you think it should be left there?—Yes; unless there is some good reason for reviving the subject.

Unless there is some reason to think that some new element has come under view which requires a new experiment to solve it?—Quite so.

Now, with regard to those new experiments, is it a matter for considerable judgment whether they ought to be tried or not?—Yes; I think it requires a very high style of judgment to do a rational experiment under such circumstances.

And that therefore the number of persons who ought to perform such experiments is at any rate very limited?—Comparatively limited.

Can you give us any instances in surgical history which would illustrate these positions?—Such instances as I can think of seem to me to have been after the fact rather than prior to the fact. Some of the most striking experiments that have been performed upon the lower animals with reference to surgery have really been already performed, not experimentally, but on the best judgment, on the human subject, and proved on the human subject; and therefore there is scarcely any necessity for the repetition of such operations on the lower animal to prove the fact. In recent times there has been more said and written to catch the public mind than there used to be on the subject; and I have observed that frequently certain operations in surgery have been referred to as having been developed in consequence of experiments performed on the lower animals. Now, John Hunter, who was one of our greatest physiologists, and allowed to be one of our greatest surgeons also, and may be said to this day to stand at the head of what is called scientific surgery in this country, is especially celebrated for an operation which he devised on the arteries. That operation for sixty or eighty years stood as one of the most brilliant in surgery; and in so far as I have been able to make out (and I have inquired into the subject), Hunter's first experiment, if it might so be called, was done on the human subject, and it was long after he had repeated his operation on the human subject and others had repeated it that the fashion of tying arteries on the lower animals originated or was developed. That fashion was quite justifiable at the time. It is no longer now justifiable; but in regard to the surgical aspect of the case, the experiment might have been left entirely untouched, for Hunter had already experimented and developed the fact on the human subject.

Then, in short, in this particular case the experiments that were tried on living animals did not establish the fact; they were only useful, if at all, for illustrating it a posteriori?—Quite so.

Now have the great performers of these painful experiments on animals been generally great surgeons?—No; I am not aware of any great surgeons having been very great experimenters on the lower animals. In this country we think that the experiments which Sir Astley Cooper performed on the lower animals were interesting; but they were some of these very operations which I have referred to after the development of the operation on the human subject. Of course, he is one of those great surgeons who did perform such operations satisfactorily for the time, but I am not aware that any very expert operator on the lower animals has made himself

thereby an expert operator on the human subject; nor am I aware that a great operator on the human subject has ever prided himself on being a good operator on the lower animals.

We have heard the name of a very celebrated surgeon, Mr. Syme. What was his practice?—My recollection of Mr. Syme's scientific investigations leads me to think that his operations on the lower animals were chiefly on dogs and rabbits, to ascertain certain views regarding the life and death and growth of bone. He used to perform a number of operations of that kind, but, though the detail of them was interesting enough at the time, I am very doubtful now whether these experiments had any special beneficial influence on the practice of surgery.

Mr. Syme was himself very unwilling to perform these experiments, was he not?—He lived to express an abhorrence of such operations, at all events, if they were not useful. I think at the time he performed them he was willing enough, because he thought that he had a great object in view.

But his ultimate authority was strongly on the other side?—Strongly on the other side, as expressed in a special report of his own in association with some gentlemen interested in veterinary surgery and physiology.

Have you a copy of that?—Yes; I have got a copy of it. About the year 1867 Mr. Syme and other gentlemen had been asked to give their opinions regarding the subject of vivisection, and there is a report published in the fortieth volume of the Veterinarian (1867) to this effect:

"We have great satisfaction in publishing the following important protest: 'We, the court of examiners for Scotland of the Royal College of Veterinary Surgeons, desire to express our opinion that the performance of operations on living animals is altogether unnecessary and useless for the purpose of causation. James Syme, chairman; James Dunsmure, M. D., president of the College of Surgeons in Edinburgh; J. Warburton Begbie, M. D.; John Lawson, president of the Royal College of Veterinary Surgeons; B. Cartledge, M. R. C. V. S., member of council of R. C. V. S.; William Cockburn, M. R. C. V. S.; William Robertson, M. R. C. V. S.; Charles Secker, M. R. C. V. S.; James Cowie, M. R. C. V. S. I fully concur in the above. John Wilkinson, principal veterinary surgeon to the forces.'"

No man, perhaps, has ever had more experience on the human subject than Mr. Syme, and I believe, from knowledge that every man is acquainted with, that he investigated by experiments on living lower animals, partly with a view of developing features in reference to the human subject, but more, in fact, in regard to physiology than with regard to practical surgery; and I myself have a strong opinion that such an expression coming from Mr. Syme (and he must have passed the middle period of life at that time) was a mature and valuable opinion.

Did I rightly understand from you just now that your own opinion in mature life was much less favorable to these experiments than it was when you were young?—Yes; because I had not the same grasp of the subject at that time. I was more, perhaps, influenced by what other people had done, and by the wish to come up to what they had done in regard to such matters; but the more matured judgment of recent years has led me to say to myself, now, that I would not perform some of the operations at this present time that I performed myself in earlier days.

Do you think that these experiments on the lower animals have contributed very much to mitigating the pain and removing the suffering of the human race?—I do not think that they have. I think they have been of great value in many respects, but certainly I can not think that they have led to the mitigation of pain in the human subject.

But that, in point of fact, they have been much more pursued by persons who are not practical surgeons than by persons who are?—Decidedly. Even with reference to the subject of chloroform the best and chief experiments were made on the human subject; all the experiments on the lower animals have been done since the experiments were conclusively applied to the human subject.

When chloroform was introduced by Sir James Simpson he tried many of the experiments on himself, did he not?—Yes; he did when he was trying the effects of chloroform. Of course, anæsthesia was advised prior to that time.

Are you able to tell us whether there is reason to believe that experiments upon animals, on the supposition that they may be necessary, are performed with all the care and all the regard to the sufferings of the animals that there ought to be?—I could not give a precise answer to that; but the impression on my mind is that these experiments are done very frequently in a most reckless manner.

In a manner that, if it were known to the public at large, would call for interference on their part?—Yes; and would bring the reputation of certain scientific men far below what it should be.

We have been told that, speaking generally, experiments of this sort are performed with the greatest possible consideration for the animal, and with the greatest indisposition to inflict at least protracted suffering. Do you believe that to be the case?—Gentlemen may fancy that, but I do not think that they fulfill that idea.

Indeed, I have reason to imagine that such sufferings incidental to such operations are protracted in a very shocking manner. I will give you an illustration of an animal being crucified for several days perhaps; introduced several times into a lecture room for the class to see how the experiment was going on.

Do you believe that to be done not only on the continent of Europe, but also in this country?—I believe it to be done in this country, from what I have heard.

Mr. ERICHSEN. For what purpose?—Some physiological experiments which the teacher might be interested in at the time.

CHAIRMAN. You think that if the public really knew what was actually going on in this country at this time they would expect an interference on the part of the Crown and Parliament?—I do think so just as much as with reference to the disinterring of dead bodies years ago.

Have you got in your mind any particular mode in which you think the Crown and Parliament could usefully interfere?—In a very vague way certainly. I think it could only be done by a judicious representation to men engaged in science that they must be careful how they resort to such experiments, and how they encourge the performance of them by those who are younger and less informed than themselves.

You have just now referred to the subject of anatomy. Do you think that any interference with experiments upon living animals of the nature of that which was introduced in regard to anatomy could be usefully applied?—I believe there might be some sensible jurisdiction, but it would be a difficult thing to point out one to please all parties.

But without attempting that impossibility, do you see your way to some interference with these experiments?—I think that an expression of some views from the Government and from the Houses of Parliament would have a very wholesome effect; that a man would then very likely run the risk of losing caste and character if he went beyond certain bounds.

For that purpose it would be necessary, would it not, that there should be publicity?—Publicity is much better than privacy in regard to these matters.

Would you see any objection to the application to this subject of the same general enactment as has been applied to anatomy?—It would be a much more difficult subject to legislate upon; the field is so extensive. There is a large amount of thought associated with the matter, giving rise to features that we can not connect with the mere taking bodies from the grave and dissecting them. Men of a very superior stamp might have thoughts in their minds, and the desire to develop these thoughts by experiments that really would be of great value to the human subject, and it would be I think a great pity that such a man should be entirely trammeled. But if you had reason to think that a man of enthusiastic mind was indulging too freely in these thoughts in that way, it might be well to bring him to his senses, to show him that he was only working in ignorance as it were.

Should I rightly represent your views if I said that you think there is some great need for a remedy, but that the application of that remedy is difficult?—Yes.

It would require, therefore, great consideration and care?—Yes.

Nevertheless, that if the public knew all that is to be known on the subject, they would be likely to demand some remedy?—Yes; I think they would.

Lord WIMMARLEIGH. You have stated that you consider that experiments involving cruelty to animals have been too frequent, and that they have not led to the mitigation of pain, generally speaking; but I presume you did not mean to say that they have not led to the successful treatment of complaints, or the mitigation of human suffering at all?—With reference to that I may perhaps speak more confidently regarding surgery than other departments in my own profession, and in surgery I am not aware of any of these experiments on the lower animals having led to the mitigation of pain or to improvement as regards surgical details.

But we have had statements here by a very high medical authority that there were several branches of medical science which have been entirely ascertained by means of these experiments. We have had brought to our attention, for instance, the circulation of the blood and the action of the heart?—Of course, everyone admits those, but then that is a bygone thing.

And on the liver and the kidneys and the nerves, we have been assured here that very great knowledge has been obtained, which could not possibly have been obtained except by vivisection?—Well, I suppose we must admit that, but I have no very strong impression on my mind as to the very great value of some of these experiments. I do not think, referring to the most recent experiments that have been made, that you can form a very accurate opinion as to the actions of nature from looking through the walls of the abdomen at the liver. You get a window cut in the side of the abdomen, and get the gall bladder laid open, and you look at it, or a physiologist looks at it, and watches it a certain number of hours or days, but the animal is put into such an extraordinary condition by all that has been done that I can not say that I have very great confidence in the results of such an experiment.

But do you think that the same knowledge would be obtained by operations on the

human body?—No, certainly not; but a great distinction should be drawn between the two, I think. Very often certain operations are performed on the lower animals, and these experiments are used in a way that they never would be used in the human subject.

Mr. FORSTER. What you meant by your answer, I suppose, was that the abnormal conditions of the experiment in which the animal was put made it very doubtful what was the advantage of the experiment?—Exactly. The opinion in my mind with regard to that might be illustrated from what we have all felt. At the beginning of the week you have felt as well as you have ever done in your life; at the end of the week you are knocked down by some kind of fever, and then every function in your body is disturbed and there is nothing in accordance with normal or healthy nature. Now, for my own part, I say that an experiment performed on my body at the beginning of the week, and one performed at the end of the week, under such circumstances, would be totally different and would lead to different results. There would not be that kind of precision in the results that ought to be considered essential, unless, indeed, you are experimenting to ascertain the difference between health and disease.

Lord WIMMARLEIGH. With the opinion that you hold on the subject, would you think it safe to abolish altogether experiments on living animals with a view to obtaining thorough surgical or medical knowledge?—No; I certainly would not go that length of restraining rational men from doing that which they thought right; but I would enjoin great caution.

Supposing that this commission was to recommend certain restrictions upon these experiments, could you suggest to us any mode by which you could distinguish useful and necessary experiments from those which you think involve cruelty and which are of no use to the human race?—In general terms I have done that already; but in regard to other ways, I think you must still leave a margin for a man's judgment, and if he chooses to display very bad judgment, he must just suffer as other men do who display very bad judgment in all the ordinary transactions of life. But it would be well that there should be some kind of superintendence, such as is indicated by you; let the man know that if he goes to excess he will fall into a low caste.

That is to say, you would leave it to the impression made on the public mind, and not to any legislative enactment. Does not your suggestion amount to that?—Yes; that is a fair view of it. I might give you an illustration of that. Perhaps it might be disputed, but my own idea is (and Mr. Erichsen, perhaps, would confirm me in that view) that so far as the treatment of human beings in hospitals is concerned (I say it with all respect to continental practitioners) there is, so to say, more humanity and kindness displayed in English hospitals than there is in hospitals abroad—in certain countries abroad, at all events—and that I attribute largely to the circumstance that every man practicing in an English hospital is largely amenable to the observation and opinions of those who take interest in these hospitals; whereas in a foreign hospital, so far as I can understand, the man is himself the sole arbiter. He may do what he chooses and there is nobody to interfere, and it will not injure his position in social life or practice; whereas if a man in this country was to get a character for roughness and rudeness and want of courtesy to his patients, to a certainty that man would soon feel that he had lost caste in the general community, and losing caste, he would not have that position that he otherwise should.

The object of this commission is first of all to ascertain what is the extent to which what is called vivisection is carried on in this country; the second object is to ascertain what is the way in which it should be treated in the future. Now, I collect from what you have just stated to us that you are opposed to legislation on the subject. Is that so? And would you prefer to leave it to the influences which you have just mentioned?—There might be, I think, an opinion expressed on the subject by the great authorities in the country, but I should be very reluctant to coerce scientific men to give up their investigations. They are considered of very much importance by many.

You would not, for instance, recommend that any particular officer should be directed to attend on every occasion when such experiments were made?—No; I think it would be a most offensive thing to men of science in this country that that should be done.

You would be satisfied, then, if this commission were to express its opinion very strongly on the subject and leave it for the consideration of the public?—That would come up to my views and feelings on the subject.

Mr. FORSTER. The proposition has been made that the legislation should bring in the principle of licensing—that is to say, licensing men who are supposed to be qualified for making experiments—to try them. Has that suggestion come before you?—I have heard it.

What do you think about it?—It is very questionable.

When you say that high authorities should express an opinion on the subject, you mean the legislature?—Yes; or the Government.

But you think that it should be a mere opinion, without attaching any penalty to persons who went contrary to that opinion?—I do not see my way to a penalty, excepting that penalty which I have referred to again and again—that a man must suffer in public estimation according to his acts and deeds.

Is it not the case that a great many of these experiments are tried by men of science in their own apartments?—I believe so.

Then public opinion would not reach those men, would it?—Yes; it would have its effect in a short time.

You think it would be known that they did try the experiments?—Yes; of course there is the Society for the Suppression of Cruelty to Animals, that would interfere; just in the same way as when a person ill uses one of his own family. If that goes on largely it is found out by the public at last and the person suffers accordingly.

Are you aware that the present cruelty to animals act is not supposed to apply to these experiments, because of the definition of "animals?"—Yes, I am aware of that feature.

Do you see any objection to enlarging that definition so as to include wild animals?—It would be a great advantage, I think, to do so.

So as to throw, as it were, the onus probandi on the man to show that he had a proper object in the experiment?—Quite so; and to make him aware that the life of the wild animal is as precious to itself as the life of the domestic animal.

The fact that that might in some degree hit the sportsman would not be an argument against it, you think?—No; that is the poor device of some people to stop all these inquiries; I do not think it is an argument at all.

You have studied anæsthetics a great deal, I suppose?—Yes.

Do you know anything of this wourali? Do you consider it an anæsthetic or not?—Forty years ago I used to use it frequently as a poison.

Do you think it is an anæsthetic?—I am not aware that we have the smallest proof to that effect.

My reason for asking that is, that in this handbook of physiology there are a great many experiments described, generally speaking, at least often they are suggested to be made under the influence of this wourali. You would not consider that that could be depended on as an anæsthetic?—Certainly not. My recollection is to the effect that it generally killed outright, and very speedily.

I suppose the fact that it is in itself a poison prevents the question being solved whether it is an anæsthetic or not, in the same way as in the case of chloroform, because no human subject ought to take it.—It has never been used or put before the profession in such a way that it could be used on the human subject as an anæsthetic, so far as I know. The way in which it was tried forty years ago was to put a little of it under the skin of a rabbit and see the rabbit die in a minute or two.

And you never saw it applied to the human subject?—No; I have never known it used for the human subject.

We are told that the reason why it is recommended in experiments is not that it makes the animal insensible to pain, but that it makes the animal still and quiet. Do you know whether that is the case?—I should doubt very much its making the animal insensible. I do not know it of my own knowledge, but I have very strong ideas with reference to these experiments performed under anæsthesia as being far less valuable. I do not go in with that view, which is very prevalent, that these experiments may now be permitted because we have got anæsthesia to prevent the pain. The experiment is not of the smallest value during its performance. You can not make a perfect experiment on the animal until it is in its normal condition.

That does not imply that you do not think that the animal is made as insensible to pain as the human subject would be?—I fancy so. I do not think that there is much difference.

What you mean is that if a man tries his experiment of course he hopes it will be a successful one; whereas you think that the anæsthetic may so derange the animal as to prevent its being successful?—It would be difficult for them to see what they want to see under anæsthesia, because the animal is no longer itself. An experiment on the human subject, for example, to whom you have given an anæsthetic, chloroform, say, goes this length—that the person is rendered insensible, and you may do any kind of painful thing to that individual for the time. That proves what I say. But further than that the anæsthetic has no other value, because when a person, having undergone an ordinary surgical operation, recovers from it, then he suffers just the same in every respect as if he had not had chloroform at all during the performance of the operation.

In the after suffering you mean?—In the after suffering; and there, I think, there is a great weakness on the part of those who try to make it appear that vivisection of the lower animals may now be more readily done than it could be before, because an experiment at the time of the animal being insensible is really of little or no value.

Several of the witnesses before us have said that they think that anæsthetics

ought to be employed wherever they could, and that the animal should be killed before it woke up to sensation. What have you to say to that?—I myself can not understand these experiments as a surgeon; I do not see what value they can be of at all.

You think the fact that the animal was under at least the temporary influence of a powerful poison would throw great doubt upon the whole nature of the experiment?—Upon the value of the experiment I think it would. I have no doubt whatever that in the case of a rabbit or a dog you could make it so insensible that you might cut out all its bowels, and the animal would never express pain by any mental or physical indication. Then, of course, you know what would happen after that.

As far as regards an experiment for merely enabling an operator to do an operation, that is to say, for a surgeon, you would say that such an experiment would be of very little use, or that it would be very doubtful whether it would be of use?—I think this is an instance which I would put at once to any man who is trying an experiment of that kind intended to be applied to the human subject, because we have had more experiments performed on the human subject than have ever been performed on the lower animals during anæsthesia.

But that objection of yours to that kind of experiments would hardly apply, would it, to experiments that were physiological, such as the discovery of the circulation of the blood, because these are experiments to see the actual process within the human body?—That I think is right enough, but I do not see that it is applicable; moreover that is a wrought out subject.

But am I right in rather gathering this from your evidence, that although you would not say that no future experiments of this kind might be useful, or even under certain circumstances necessary, yet you attach less value to them than many other members of your profession, for two reasons; first, because the actual experiment itself puts the animal into an abnormal condition; secondly, that anæsthetics when used, would in addition put the animal into an abnormal condition?—I have no strong ideas about the experiment itself apart from anæsthesia, though in some instances I believe dogs laid hold of suddenly and violently, and pinned down on a board, get into such a violent and excited state that you have not the animal in its normal condition.

Mr. ERICHSEN. In reference to a remark that you have just made, I will ask you a question, because it is novel to me. Is it the case that dogs are ever "pinned" to boards, or that animals are crucified, as you said in another part of your evidence?—I have not myself seen it, but I have heard of it frequently, and I have had brought under my notice in the last nine months the case of two dogs being strapped to boards (I meant pinned to them in that sense) at Norwich, and a surgeon went up and cut the straps so as to let the creatures have some kind of relief. Let me also draw your attention to this—you know that frogs are not strapped; they are pinned and tied; pinned more frequently than in any other way.

With regard to surgical experiments, you have had immense experience, as we all know, not only in surgery itself, but also in the education of young surgeons, and in watching the process of many surgeons through life. Is it your experience or not that surgeons perform operations upon living animals with a view of accustoming themselves to operations, so as to acquire dexterity in operations on the human subject?—It is not my experience. I have heard it said that it might be done.

But it is not your experience that it is so done in this country?—Certainly not.

I gather from you that it is not the habit of surgeons to practice vivisection for the purpose of acquiring dexterity upon human beings?—Certainly not in this country.

And that it would be useless to do so, because the condition of the tissues is very different?—Yes; the surroundings are so very different that I should place no confidence in any man who acquired additional experience in that way.

A great many of the most eminent surgeons in this country, Sir Charles Bell, Sir Astley Cooper, Sir Benjamin Brodie, Mr. Travers, Mr Lawrence, and others, have all performed experiments of various kinds upon animals; these have been to elucidate a certain definite point, and in the hope of adding something or other to the general stock of human knowledge?—They have also been performed by gentlemen, such as these, to aid in the development of special views of their own, and, so far as I have been able to judge, very legitimately.

You stated, I think, that operations in surgery were not usually first of all performed upon animals and then upon the human subject.—Yes; I have a very strong impression to that effect. I have thought over it again and again, and have not been able to come to a conclusion in my own mind that there is any single operation in surgery which has been initiated by the performance of something like it on the lower animals.

The operations that have been performed on the lower animals, with a view of elucidating similar procedures upon the human subject, have all been performed after those operations had been done on the human subject?—Invariably. Whatever has been done after is a matter of curiosity.

We are told that some of these experiments have thrown great light upon practical surgery, as, for instance, Mr. Jones's experiments upon the kind of ligature to use upon the arteries; that before his time John Hunter used broad ligatures, and that bad results followed the use of those ligatures, and that the experiments performed by Mr. Jones threw great light upon the proper sort of ligature to use, and were consequently of use to surgeons. What is your view as to that?—Jones's experiments were of considerable value to surgery at that particular time, but they have all been done again and again.

And it would not be proper to repeat them?—Certainly not.

That is a past matter; but at the time they were of great service to surgery?—Up to this day, I may say with regard to that point, practical surgeons seem to have as much difference of opinion as to the best kind of ligature as they had in Jones's day.

Experiments have been made of late years on that very point by Mr. Lister, of Edinburgh?—Yes; and by many others.

Mr. FORSTER. Experiments on animals or on the human subject do you mean?—On animals and on the human subject. Experiments are going on on the human subject daily just now; but these are rational experiments—quite legitimate.

Mr. ERICHSEN. Experiments on the human subject—that is to say, after the operation—one surgeon uses one kind of ligature and another another?—Yes; it is the object of the experiments to ascertain what is best. But in saying that I do not mean to say that it is a reckless operation as to human life.

I am not at this moment speaking of the indirect influence that experimentation on the lower animals has on the progress of surgery, but we have been told that certain observations, such as those which are made in what may be termed pathological experimentation, the production of inflammation, for instance, in the web of a frog's foot, and so forth, have had a very direct bearing (and no doubt they have) upon the progress of medical science. Have such experiments, in your opinion, had any direct bearing upon the progress of surgical practice?—Well, I do not think it. I was as familiar as most people with these experiments, and I can not say that I have been much impressed with the value of them.

Has your own practice been very much influenced in any way whatever by what has been observed in this way in the lower animals, or has it been the result of your own clinical and pathological observation on the human subject?—Chiefly the latter; and since I have been indoctrinated with the usual views that are held in this country, I can not say that I have had my mind opened up by experiments to any increase of knowlege on this subject.

I suppose we may say this, that medicine is based not only upon physiological, but also upon clinical, observation and pathology?—Yes.

And in your opinion is clinical observation and pathological observation of more service to practical surgery than experimental physiology?—Yes. There is a precision in the one while the other is largely theoretical.

Mr. HUTTON. Have you seen anything of the experiments for the transfusion of blood to which Sir James Paget referred in his evidence?—I think I may have seen once or twice the transfusion of blood from one human being to another, and I have known it in my experience again and again.

Can you say whether the experiments on animals on that subject were, in your opinion, essential to the determining of the proper conditions for that transfusion?—I do not think they would be of the smallest practical value.

You were a witness, were you not, of that experiment at Norwich which has been alluded to?—No, I am happy to say I was not; I was a witness in the trial.

But, in your opinion, the attempt to determine the effect of absinthe and alcohol on the stomach by transfusing it into the veins of an animal was a perfectly useless experiment?—I think it was grounded upon incorrect views altogether. There is no strict analogy between the two, particularly when you want to put that analogy in association with a similar thing in the human body.

And did I rightly understand you to say that Mr. Jones's experiments on the ligatures had not determined the question at all of the kind of ligature best suited for the arteries?—That is so. The controversy has been going on ever since, and variety of opinion still exists.

Experiments on the human body are much more efficient for the purpose than experiments on the arteries of animals?—The ordinary operations, I would hardly call them experiments, are much more efficient. All such experiments have been founded on reason, and without any risk to the human being.

Do you know anything of this handbook of Dr. Sanderson's?—I have heard a good deal about it, but I have purposely rather avoided it.

You can not give any opinion on the experiments described in it?—I have heard something about them. I fancy a large number of them are such as ought not to be sanctioned.

Sir John KARSLAKE. Would you let me know what are the grounds upon which you state the opinion that there is a great deal of reckless practice of vivisection

going on at the present time?—I hear young men who are pupils, or have recently been pupils, speaking of what they have seen in the theaters, lecture rooms, and laboratories of those who profess to teach physiology.

Could you point out to the commission particular theaters or lecture rooms or laboratories in which you have heard that these practices prevail?—I could not be precise.

Could you give us some clue by which we could get evidence for the purpose of ascertaining to what extent they prevail?—I can only do it in very general terms. I should recommend inquiries to be made at any of the physiological institutions in London and elsewhere.

Is it from what you have heard of what goes on at those theaters and laboratories that you have formed the opinion that there is a great deal of reckless practice of vivisection prevalent at the present time?—Yes; and I might have seen it in the papers, too. In some of the Edinburgh papers recently there has been a letter from "A Citizen of Edinburgh," in which he questions the propriety of the system by which, when they are building a new university in Edinburgh, it should appear conspicuously that very careful provisions are being made for the lower animals that are to be kept in the institution for the purpose of performing experiments upon them. I think that is proof enough to show the estimation in which in certain quarters that style of practice is held.

My question was rather pointed to the prevalence of the practice, and the sources from which we could ascertain whether it does prevail, and if so, to what extent?—I think the best authority I can refer you to is the best and largest of the teaching institutions in London

CHAIRMAN. Your opinion is that the value of these experiments has been altogether exaggerated?—I do hold that opinion.

But that if in the hands of the principal scientific men of this country public opinion would be a sufficient check upon them?—Yes; that is my impression.

And that the notion of being generally reputed to be very indifferent to suffering would be such as to prevent any of them continuing so or becoming so, even if they would otherwise have been disposed to become so?—Yes; I think public opinion would have a large influence upon the practices of such men.

For that purpose it would be necessary, would it not, that something should be known about the proceedings that were going on in the different theaters and lecture rooms?—It would certainly be beneficial to your investigation that you should know that.

But for the influence of public opinion upon scientific men it would be necessary that public opinion should have something to form itself upon, would it not?—Yes.

That is to say, unless the public knows what is going on it can neither form nor express any opinion upon it?—Quite so.

And your opinion, as I understood you, is that at this very moment there is a great deal going on in this town which, if the public did know, would excite them very much?—That is my impression from what I hear.

And public opinion is, in the present state of the law and practice of the country, quite unable to bring itself to bear upon it?—Yes.

Something, therefore, must be done in order to enable that public opinion to produce the effect that you speak of, must it not?—Possibly you gentlemen might bring before you some of the most intelligent of, say, the young members of the profession or the senior students of the profession who have recently been attending lectures and demonstrations on physiology, and from them perhaps you would get the information.

But I want to draw your attention to a different point. You have said that something requires to be done to check what you consider an amount of cruelty now going on?—Yes.

But when pressed upon the subject as to the particular mode of doing that you expressed a hope that public opinion would have a sufficient influence to bring about that result?—Yes.

Then what I have pointed out to you is that under the present state of our law and of our practice these things appear to be going on, and yet public opinion appears to have no opportunity of operating, because it does not know what is going on?—Yes.

It will therefore, according to that view, be a consideration for this commission whether they should not recommend some change in the law and practice by which everybody who does these things shall hereafter be subject to some influence of public opinion; is not that so?—Yes.

That would point to some change in the law?—At all events, to an expression of opinion from some of the highest sources in the Kingdom.

But an expression of opinion which should not be brought to bear upon the practice of a person who is permitted to continue the practice without the knowledge of the public would be inoperative, would it not?—We have already in some degree

referred to that. First of all, I would suggest that if you gentlemen were to have information sufficient to convince you that such practices are going on to an extent that you do not think should be permitted, it would be for you to recommend to the Government to either say or do something on the subject. Then I think I would say as to the next part of your question that in the present state of the law we have the Society for the Suppression of Cruelty to Animals keeping a constant watch upon such matters, and a person amenable to the law at this present time for cruelty to animals would be still more likely, I think, to be put in the right course, or to have his practices suppressed altogether, if it were done under stronger sanction than there is at this present time. There is a common law at this present time, but we should have some additional expression indicating that the Government could not tolerate this sort of thing in this country.

At the present moment there is, according to your belief, much going on somehow or other which ought not to go on?—That is my impression.

And that probably the law and the practice, as it stands at present, is not sufficient to prevent it?—It does not reach it at the present time.

And that which you would recommend would be, I suppose, that some change in our law and practice should be made which would enable us to reach it?—Quite so.

And then, so far as the most eminent scientific men are concerned, you think that after that had been done, public opinion would have sufficient influence with them?—The fear of an unfavorable opinion, I think, would have great influence with them.

Then, with regard to other persons than those eminent scientific people, it might, perhaps, be necessary for some severer measures to be taken with regard to them, might it not?—Yes; if there was excessive cruelty or an excessive want of common humanity.

Supposing a comparatively ignorant person, from whose experiments no real good could reasonably be expected, were nevertheless to practice such experiments; do not you think that something stronger than public opinion might be brought to bear upon him?—I think there would be some difficulty in applying that to people in the position of quacks and bonesetters, and so forth; because you might arouse in the mind of the public the feeling that the man was a persecuted man; that the whole profession had gone against him, and you might make rather a martyr of him than otherwise, and probably an elevated martyr.

In fact, you would suggest that if the commission did recommend any further proceedings, they should take care not to exceed the limits of public opinion, not to go beyond what public opinion might be expected to support?—Yes. I think when you are referring to that subject, I may say that it has struck me that it would be well, with a view to what may be the result of this investigation which you are engaged in, if the attention of the governors of medical schools were called more forcibly to the subject than at this present time; that there might be certain governors in each school who should take an interest in the matter, and see that there was no unnecessary cruelty in a part of the institution where it is admitted generally that there must be a certain amount of cruelty for special purposes.

But that is limited to the great hospitals and scientific schools, is it not?—Yes; it would be limited to them. But I do not think there is much of this that goes on irrespectively of these schools. I do not think that there is much amateur physiology going on in this country.

But if there was, it would be still more necessary, would it not, to provide a remedy in that case?—Yes; if that was ascertained, it would be a very important thing.

Mr. FORSTER. I think you said that you think what goes on that ought not to go on is mainly at the large institutions?—So far as I can make out. I believe that here and there there are outsiders, so to say (I speak of them with respect), who are not actually in these institutions. They are zealous and talented men, and take opportunities of their own where they can, and I think it would be a pity to restrain even these men so long as it was seen that they were under a wholesome influence.

Has it ever occurred to you whether, as regards these large institutions, it might not be well to put them under the obligation to make a public report of the experiments that they were performing?—That has occurred to me. It might be a very good rule to make.

Take, for instance, what is going on now; we hear different accounts, and it is very difficult to know accurately what is going on, and therefore it is very difficult for public opinion, in any reasonable manner, to operate upon them; but supposing they were under an obligation to declare what they had done, and why they had done it, then public opinion could form, could it not, a reasonable judgment?—I think that in legislation on the subject it would be a very important thing to have some view of that kind developed. It had a very wholesome effect on the conduct of dissecting rooms, for instance. Now, there can not be a subject in a dissecting room without there being a proper account of it, where it has come from, how long it has been there, etc.

At the present moment they are compelled to keep an account of dead human bodies?—Yes; and if there is a large piece of a body lying there that can not be accounted for, the individual that has that piece, the professor of anatomy, is immediately amenable to the law, and the law is very stringent. He would have his license taken from him, and his school, so far as the teaching of anatomy was concerned, would be put an end to. There is a very wholesome regulation of the practice with reference to that matter.

And in the same manner, I suppose, it would be possible to say that a report must be made day by day of any experiments on a living animal, and why it was done?—At certain dates. Day by day would be, perhaps, too much officiousness; but I have thought in my own mind that it would be quite possible that you should have an inspector of these experiments, just as they have an inspector of anatomy; and that just as the common law enables the authorities to send detectives in certain directions to ascertain who may be in certain houses, so they should be able to send men who should say, "I should like to see the number of dogs and rabbits or cats about this place." I think that would have a very wholesome effect.

CHAIRMAN. There was a great excitement about anatomy, we are told (and many of us are old enough to remember it), when the law was in its old state?—Yes.

That excitement was entirely put down by the changes which have since been made, and there is no public complaint any more on the subject. Do you think that something analogous to that might be adopted if there should be reason to believe that things are done in this matter which would not be satisfactory to the public if they knew of them?—Yes; I think it would be a very wholesome thing to do, if this commission were satisfied that these practices were carried to an exorbitant extent.

In other words, if they were satisfied that there was sufficient occasion?—Yes.

Mr. KENNEDY. Some time ago this subject was discussed before the Anthropological Society of Washington. At that meeting we had a glib young doctor who declared that such and such things had stamped out certain diseases that prevailed among cattle. I have kept cattle all my life as a man, and I can say that if there is one thing more than another that will stamp out disease or, better yet, prevent it, it is sanitation. If our doctors would turn their attention more to sanitation among human beings more cures would be effected, and less disease contracted.

Now what we want to secure by this measure is simply governmental inspection, that is all, and no humane man or true over of science can object to that. Simply inspection, with a report as to the result of those experiments.

Another scientist—my friends on the medical side know this man—Dr. Burdon-Sanderson, says that the state of things he would like to see established with reference to physiological research is such as would unquestionably discourage the making of experiments by anyone except persons trained in a school of physiology. This bill provides that only persons who are licensed shall perform these experiments, and the bill also prescribes the qualifications necessary for a license.

Dr. Lyman Playfair's bill, which Dr. Sanderson recommended, was objectionable in the view of the commission because it would have prohibited experiments for the purpose of demonstration, even under complete anæsthesia. That is, he went so far in his opposition to vivisection for the purpose of demonstrating proved facts that he would have had the English Parliament abolish it entirely in all schools and colleges when done for the purpose of demonstration.

Dr. GEORGE M. STERNBERG. Gentlemen of the committee, I have the honor to submit for your consideration the following reasons for objecting to the legislation proposed by Senate bill 1552:

(1) So far as I know no evidence has been presented to show that unnecessary and cruel experiments upon the lower animals are being performed in the District of Columbia.

(2) Punishment for cruelty to animals is already provided for by law.

(3) It is an unjust reflection upon those engaged in scientific research

work to suppose that they are less humane than other members of the community, and that special legislation is necessary to cause them to administer anæsthetics to animals subjected to painful experiments.

(4) Such legislation would be offensive class legislation, inasmuch as it prescribes the use of anæsthetics in scientific "experiments," but fails to provide for the use of anæsthetics in the painful cutting and crushing operations upon male colts, calves, pigs, cats, etc., which are constantly practiced by farmers, veterinary surgeons, and others; and it takes no account of pain inflicted upon the lower animals for "sport" or for gain.

(5) The progress of scientific medicine has been largely due to experiments upon the lower animals, and the restrictions upon such experiments proposed by this bill would have a very unfavorable effect upon the further development of our knowledge in all departments of biological research.

In support of the last statement made, I submit for your consideration and ask to have made a part of my remarks a paper recently read by me before the Anthropological Society of this city.

Senator GALLINGER. That will be done.

STATEMENT OF GEORGE M. STERNBERG, M. D., LL. D., SURGEON-GENERAL UNITED STATES ARMY.

The advancement of knowledge in all departments of science depends largely upon the application of experimental methods of research for the solution of the problems which present themselves.

The efforts of philosophers to determine by processes of reasoning the elementary substances in nature and the laws governing natural phenomena have been futile. Even if, by a happy guess, the truth has been divined, an experimental demonstration is usually necessary before this is made evident. Science is founded upon observation and experiment, but very often the evidence of our senses can not be relied upon in the absence of an experimental demonstration of the truth of the observation made. During a journey across the desert we think we see a lake, but the experiment of trying to approach it convinces us that it was a mirage. We are convinced that we feel a cinder in our eye; investigation shows that the sensation is caused by congested blood vessels and that the cinder which caused this condition is no longer present.

A sound is heard like the distant ringing of church bells, but the experiment of closing the ears shows that it is subjective, and we recall the fact that some quinine pills were taken a few hours before. If, however, we had never heard that such an effect results from taking quinine, we would be at a loss to account for the phenomenon, and following the nonscientific post hoc ergo propter hoc method of reasoning, might conclude that it was caused by eating beans for breakfast. A priori this might appear quite as probable as the suggestion that the phenomenon was due to the quinine pills taken before breakfast. Evidently a question of this kind can only be settled by a series of experiments. These would develop the facts that in the absence of beans for breakfast a similar result followed when a corresponding dose of quinine was taken before breakfast, and that when no quinine was taken, ringing in the ears did not follow the eating of beans.

These few examples will serve to illustrate the proposition that knowledge depends upon observation—under which term I include all kinds

of sensual impressions—verified by experiment, i. e., by experience. Webster gives the following definitions of the word experiment:

(1) A trial deliberately instituted; an act or operation undertaken in order to discover something unknown, or in order to test, establish, or illustrate some allied or known truth; practical test; proof.
(2) Instruction gained by experience; experience.

The child learns by experiment that it can not reach the moon; that sugar tastes good; that the stove burns, etc. The savage learns by experiment that certain kinds of wood are good for bows, and other kinds for arrows; that flint and obsidian may be chipped into suitable shapes for arrow points; that certain roots are good to eat, and others are not. The farmer learns by experiment that certain soils are adapted to certain crops; that increased returns are obtained by rotation of crops, etc.

The artist learns by experiment that the blending of certain colors gives a certain desired result; that the effect he is aiming at may be attained by a certain method of applying his colors upon the canvas, etc.

By means of the experimental method the chemist has succeeded in analyzing air, earth, and water, which were regarded by the ancients as elements, and has learned to manufacture in his laboratory, by synthetic processes, many of the complex organic substances found in nature. By experiment the physicist has demonstrated the persistence of force and the correlation of the various modes of motion known to us as heat, electricity, etc. He has learned to recognize the elements of the chemist in distant suns by means of the spectroscope, and has recently shown us that certain ethereal vibrations may pass through wood and metal as light rays pass through glass.

In like manner biologists and physicians have established the facts which constitute our knowledge of biology in all its branches. Used in its broadest sense this term includes animal and vegetable physiology, animal and vegetable pathology, etiology, morphology, embryology, psychology, and sociology. Now, it is evident that all questions relating to these various branches of biological knowledge must be determined by the observations of living organisms and by experiments upon living plants and animals. To some extent the study of morphology and of pathology constitutes an exception to this general rule, inasmuch as these branches of biological science also call for the dissection of dead plants and animals. Our knowledge of animal and vegetable histology, of human anatomy, and of the results of disease processes has been obtained in this way, and could not have been obtained in any other way. But the dissection of dead plants and animals can not determine the functions of the various anatomical elements and organs revealed by such dissections, although aided by the microtome, differential staining methods, the microscope, etc. Nor can the study of the results of disease processes in the post-mortem room and in the pathological laboratory settle questions relating to the etiology of a disease, its mode of transmission if infectious, its clinical history, or its treatment. These are the questions which most concern the practical physician and his patients, and scientific medicine depends upon their solution by scientific methods, i. e., by observation and by experiment.

Without doubt the progress of medicine and of science generally has been greatly retarded by too great a reliance upon conclusions drawn from individual observations, without submitting these conclusions to the test of experiment. The liability to error results (*a*) from the unreliability of conclusions based upon sensual impressions; (*b*)

from hasty adoption of the post hoc ergo propter hoc argument; (*c*) from the fact that the observation is not submitted to a proper control. Illustrations have already been given of the first source of error (*a*). Under the influence of superstition, fear, narcotics, or a lively imagination, delusive sense impressions may give rise to a belief in ghosts and phantoms of various kinds; or a cerebral congestion may bring up in the usually well-balanced mind a subjective apparition which it is difficult to believe is only a figment of the brain. (*b*) The unjustifiable inference that a certain result is due to some antecedent circumstance, in the absence of any satisfactory scientific demonstration of a casual connection between the two events, is a source of a large share of the error which exists not only among the ignorant, but also among the educated classes in civilized countries. The methods and deductions of science make their way but slowly, and the exactions of scientific demonstration are but little understood by those who are not engaged in scientific research.

In medicine this unscientific credulity is unfortunately not confined to the laity. Over and over again remedies have been lauded as specifics by well-meaning physicians upon the supposed clinical evidence obtained in a limited number of cases, and have been proved to be useless when submitted to the test of a more extended and unprejudiced trial. Science not only demands an experimental demonstration, but hesitates to accept such a demonstration as conclusive unless it has been verified by one or more unprejudiced observers who are known as reliable and who record all of the steps of their experimental research.

On the other hand, the nonscientific constantly arrive at conclusions from insufficient data and are disposed to resent any intimation that the evidence they advance in support of their conclusions is inadequate.

In scientific experiments the same causes under uniform conditions are expected to give uniform results; and the relation of cause and effect is determined by control experiments (*c*), which show that in the absence of the supposed cause, all other conditions being the same, the effect is not produced.

In clinical experiments contradictory results are obtained and false deductions made from a failure to recognize the essential conditions of scientific experimentation, and also because of the difficulty in securing uniform conditions and a proper control experiment. For example: A certain medicine is affirmed to be a specific for pulmonary tuberculosis and is being tested to determine its value in the treatment of this disease. In the first place we must inquire who has made the test; whether it is an interested party who proposes to make money or reputation; whether the diagnosis in the cases reported as cured was made by a competent and disinterested physician; whether the cases were in the early stage of the disease or otherwise; what was the family history, the personal history, and the environment of each case; what other treatment was carried on at the same time.

A properly conducted scientific test requires that the results claimed be controlled by placing two or more similar cases under identical conditions and observing whether a decided difference in the progress of the disease or of recovery is manifest in the cases treated by the method under consideration as compared with those not treated. Evidently these ideal conditions for arriving at just conclusions can not, as a rule, be obtained in clinical medicine. But in hospital practice it is sometimes possible to conduct experiments as to the value of proposed methods of treatment in which an approximation of these conditions is

attained; and scientific medicine has been greatly advanced by carefully conducted experiments of this kind and by a comparison of the collated results of the treatment of large numbers of patients by special methods. But in many cases a more satisfactory demonstration may often be made by experiments made upon the lower animals. As a typical scientific experiment of this kind, made by a master in the application of the experimental method, I beg leave to quote the following account of an experiment by Pasteur:

On June 13, 1881, Pasteur communicated the results of his famous experiment at Pouilly-le Fort, near Melun. He says:

> On the 5th of May, 1881, we inoculated, by means of a Pravaz syringe, 24 sheep, 1 goat, and 6 cows, each animal with 5 drops of an attenuated culture of the anthrax bacillus. On the 17th of May we reinoculated these animals with a second virus, also attenuated, but more virulent than the first.
>
> On the 31st of May we proceeded to make a very virulent inoculation in order to test the efficacy of the preventive inoculations made on the 5th and 7th of May. For this experiment we inoculated the 30 vaccinated animals, and also 24 sheep, 1 goat, and 4 cows, which had not received any previous treatment.
>
> The very virulent virus used on the 31st of May was obtained from spores preserved in my laboratory since the 21st of March, 1877.
>
> In order to make the experiments more comparable, we inoculated alternately a vaccinated and a nonvaccinated animal. When the operation was finished all of those present were invited to reassemble on June 2, i. e., forty-eight hours after the virulent inoculation was made.
>
> Upon the arrival of the visitors on June 2, all were astonished at the result. The 24 sheep, the goat, and the 6 cows which had received the attenuated virus all presented the appearance of health. On the contrary, 20 of the sheep and the goat, which had not been vaccinated, were already dead of anthrax; 2 more of the nonvaccinated sheep died before the eyes of the spectators, and the last of the series expired before the end of the day. The nonvaccinated cows were not dead. We had previously proved that cows are less subject than sheep to die of anthrax. But all had an extensive œdema at the point of inoculation, behind the shoulder. Certain of these œdematous swellings increased during the following days to such dimensions that they contained several liters of liquid, deforming the animal. One of them even nearly touched the earth. The temperature of these cows was elevated 3° C. The vaccinated cows did not experience any elevation of temperature, or tumefaction, or the slightest loss of appetite. The success, therefore, was as complete for the cows as for the sheep.

Since this convincing experiment was made anthrax inoculations have been made on a large scale in France and in other parts of Europe, in which this disease has for many years caused enormous losses among the flocks and herds.

The result of anthrax inoculations made in France by Pasteur's method during the past twelve years has recently (1894) been summarized by Chamberland. The veterinarians who made the inoculations were each year called upon to answer the following questions: (1) Number of animals inoculated. (2) Number of deaths from first inoculation. (3) Number of animals dying within twelve days after second inoculation. (4) Number of animals dying of anthrax within a year after protective inoculations. (5) The yearly average loss before inoculations were practiced. The total number of animals inoculated during the period to which this report refers was 1,788,677 sheep and 200,962 cattle. The average annual loss before these protective inoculations were practiced is said to have been about 10 per cent for sheep and 5 per cent for cattle. The total mortality from this disease among inoculated animals, including that resulting from the inoculations, was 0.94 per cent for sheep and 0.34 per cent for cattle. Chamberland estimates that the total saving as a result of the inoculations practiced has been 5,000,000 francs for sheep and 2,000,000 francs for cattle.

Another equally brilliant experimental demonstration is that made by Pasteur before a commission appointed in 1884 to investigate his

method of conferring immunity against hydrophobia. He inoculated 19 dogs in the presence of this commission as a test experiment.

These animals had been rendered refractory by his method. The 19 protected animals and 19 control animals, obtained from the public pound without any selection, were tested at the same time. The test was made upon some of the animals of both series by inoculation with virulent material upon the surface of the brain, and upon others by allowing them to be bitten by rabid dogs, and upon still others by intravenous inoculations. Not one of the protected animals developed hydrophobia; on the other hand, 3 of the control animals out of 6 bitten by a mad dog developed the disease, 5 out of 7 which received intravenous inoculations died of rabies, and 5 which were trephined and inoculated on the surface of the brain died of the same disease.

With reference to his first inoculations in man, Pasteur says:

> Making use of this method, I had already made 50 dogs of various races and ages immune to rabies, and had not met with a single failure, when, on the 6th of July, quite unexpectedly, three persons, residents of Alsace, presented themselves at my laboratory.

These persons were Theodore Vone, who had been bitten on the arm on July 4; Joseph Meister, aged 9, bitten on the same day by the same rabid dog, and the mother of Meister, who had not been bitten. The child had been thrown down by the dog and bitten upon the hand, the legs, and the thighs; in all, in fourteen different places. Pasteur commenced the treatment at once, and had the satisfaction of reporting to the Academy of Sciences in March of the following year (1886) that the boy remained in perfect health. Since this time Pasteur institutes for the treatment of hydrophobia have been established in all parts of the civilized world, and the statistical reports published justify the belief that when the treatment is instituted at an early date after the bite, and is properly carried out, its protective value is almost absolute. At the Pasteur Institute in Paris 9,433 persons were treated during the years 1886 to 1890, inclusive. The total mortality from hydrophobia among those treated was considerably less than 1 per cent (0.61). In 1890 416 persons were treated who had been bitten by animals proved to be rabid, and among these there was not a single death. In 1891 the number of inoculations was 1,539, with a mortality of 0.25 per cent; in 1892, 1,790, with a mortality of 0.22 per cent; in 1893, 1,648, with a mortality of 0.36 per cent; in 1894, 1,387, with a mortality of 0.50 per cent.

While the experience of the individual, for reasons stated, is very apt to lead him to false conclusions, and in the case of those not trained in scientific methods has comparatively little value, the combined experience of a considerable number of individuals, if they have reached a uniform conclusion, is entitled to great consideration. Yet even in this case experience teaches that, owing to preconceived notions, partisan feeling, or other causes, an erroneous conclusion may be reached and may be generally accepted as truth until the light of science dispels the illusion.

What has been said will, I trust, make it apparent that progress in the biological sciences calls for experiments upon living things. Vegetable physiology, vegetable patholgy, and scientific agriculture are based upon experiments upon living plants. The questions which have been solved and which remain to be solved in this department of biological research are innumerable, and owing to the important economic interests involved liberal support is given to those engaged in investigations relating to plant diseases and their prevention, and to the

various problems relating to soils, climates, manures, field crops, etc., which in this country claim the special consideration of the Department of Agriculture and of the agricultural colleges of the several States.

As connected with agricultural interests, the Department of Agriculture has also given much attention to investigations relating to the cause and prevention of the infectious diseases of domestic animals, and the Bureau of Animal Industry in this Department is charged not only with these investigations, which have led to results of the greatest value, but also with the execution of the measures which have been proved to be most efficacious for preventing the spread of these infectious diseases. Now, all of our precise knowledge of the etiology and prevention of these diseases is based upon vivisection experiments; and the thousands and hundreds of thousands of sheep, cattle, horses, and swine which have been saved to their owners in this country and in other parts of the civilized world are to be placed on the credit side of the account against the comparatively small number of animals of the same or of other species which have been sacrificed in attaining the knowledge which has enabled us to make this great saving. Before going any further it will be best to explain that while the term vivisection originally related only to cutting operations upon living animals, its use has been extended by those who have been led to enter upon a crusade against experiments upon living animals so that it now includes all experiments to which they are subjected. Thus the injection of a culture of one of the pathogenic bacteria under the skin of a guinea-pig becomes a vivisection experiment.

It is by experiments of this kind that our knowledge of disease germs has been acquired and without such experiments it would be absolutely impossible to distinguish between the harmless bacteria which abound in nature and the deadly germs of tuberculosis, cholera, typhoid fever, puerperal fever, glanders, swine plague, hog cholera, anthrax, etc., which to-day are as well known in pathological laboratories as are the indigenous plants in our fields to the well-informed botanist. Our knowledge of the toxic, medicinal, or harmless character of the higher plants has been gained by experiment. Those who first attempted to make a salad of lobelia or of belladona leaves no doubt paid dearly for their experience, and in general it is best to make a test upon one of the lower animals before consuming an unknown plant, root, or berry unless our botanical knowledge enables us to say with certainty that it belongs to a harmless family. So also with the low plants known as bacteria. While some are harmless others produce the most deadly toxic substances, and as human life is too valuable and sacred to be sacrificed in experiments designed to test the question as to pathogenic potency, we resort to experiments upon the lower animals. Without doubt experiments have resulted in an immense saving of human life as well as in the advancement of scientific knowledge in all departments of biology. Yet the ultra antivivisectionists insist that they are unjustifiable, and, if they had their way, would enact legislative measures calculated to entirely arrest all profitable research in this the most important department of human knowledge.

If there had been no experiments upon the lower animals in the past we would to-day be in utter darkness and given over to vain theories as regards the specific causes of the infectious diseases and many fundamental facts in physiology, phycology, medical and surgical therapeutics, and general biology.

Happily, the painful dissections which were made by the enthusiastic explorers in this field of investigation are seldom called for at the present day, and by the use of anæsthetics suffering on the part of the animals subjected to experiment is avoided to a large extent.

That those who devote themselves to biological studies are less susceptible to humane sentiments than their fellow men and women, that they inflict unnecessary pain with indifference, or that, as has been charged, they take a cruel pleasure in the sufferings of the helpless victims of their experiments, I believe to be an unfounded calumny based upon ignorance and an excited imagination on the part of those who have arrayed themselves in opposition to experiments on living animals.

As a matter of fact, these experiments have been conducted for the most part by members of the humane profession of medicine in the interest of humanity; and, as already stated, they form the basis of the scientific medicine of the present day.

I have thus, in a general way, indicated the objects and results of vivisection experiments. There are those who deny that any important results have been obtained in this way. Such a position can only be taken by one who is grossly ignorant of the present status of the biological sciences, and a course of elementary lectures would be necessary for his enlightenment. That results have not always equaled the expectations of the experimenter, and that many useless experiments have been made, can not be denied. But this is true in all departments of scientific investigation. The chemist or the physicist, when disappointed in the results of experiments undertaken for the solution of some problem relating to matter or force, renews the attack by devising new experiments and new apparatus. In like manner, too, the biologist and the scientific physician, when foiled in their efforts to elucidate the problems which confront them, and profiting by the experience gained in their unsuccessful experiments, often succeed in the end by repeating their experiments under different conditions or by devising new methods of research.

In biology, as in other departments of scientific research, it has often happened that experiments conducted in the first instance simply to gratify that scientific curiosity which seeks to explain all things have led to practical results of the highest importance. A notable example of this is found in the experiments of Galvani, which demonstrated the fact that two metals in contact give rise to an electrical current which causes a contraction of the muscles in the legs of a frog. It is unnecessary to point out to this audience the immense practical results which have followed the demonstration of this fundamental fact, which has relations both to physical and to biological science. A more recent but equally notable example of practical results following scientific investigation is the discovery of the antitoxins. Already we have evidence in several infectious diseases that the immunity, of longer or shorter duration, which follows an attack is due to the presence in the blood of an albuminoid substance developed during the attack. This we call an antitoxin, because it has the power of neutralizing the toxin produced by the pathogenic bacteria to which the disease is due. This remarkable and unexpected discovery has resulted from experiments made in the first instance for the purpose of testing various methods of producing artificial immunity, and of explaining the phenomena connected with natural and acquired immunity.

All of the experiments relating to this subject have been made upon the lower animals and the knowledge gained could not have been obtained in any other way. Already we have experimental evidence

that in animals which have an acquired immunity against diphtheria, tetanus, cholera, erysipelas, vaccinia, hydrophobia, pneumonia, and certain other infectious diseases, there is present in the circulating fluid an antitoxin, upon which their immunity depends. And it seems probable that this is true as regards other infectious diseases. The researches of Behring, of Berlin, and Roux, of Paris, have led to a practical application of this knowledge in the treatment of diphtheria, and the value of the method is now well established by clinical experience. There is also satisfactory evidence of the value of the tetanus antitoxin in the treatment of tetanus, and good reason to believe that in the near future success will be attained in the treatment of several other infectious diseases by means of an antitoxic serum obtained from animals upon which a high degree of immunity has been conferred by repeated injections of pathogenic bacteria or their toxic products.

These results open up a new vista for scientific medicine. And the exact knowledge which has been obtained of the biological characters of the best-known pathogenic bacteria enables sanitarians to give definite advice with reference to disinfection and other measures of prophylaxis. Preventative medicine is thus placed upon a scientific basis and no doubt a great saving of human life has already resulted from the practical application of the knowledge already acquired. But there are still many biological problems awaiting solution which call for continued investigation by experimental methods, and earnest workers in all parts of the civilized world, in biological and pathological laboratories equipped for the purpose, are zealously devoting themselves to the solution of these problems. It is very discouraging to students of biology and to all those who are well informed as to the objects and results of vivisection experiments to see an organized effort on the part of certain well-meaning but ill-advised persons to restrict progress in this department of scientific research by legislative enactments, which assume that students of biology are not controlled by the humane instincts which are characteristic of civilized man, and that espionage and legal penalties are required to prevent them from inflicting unnecessary pain upon the animals which are the subjects of their experiments.

By way of supplementing what I have said in my statement, and speaking of the terrible things connected with the torture of conscious animals, I would add that I am prepared to state that the torture of conscious animals is something we all most decidedly object to in every possible way, and if it is necessary to enact laws in this District to prevent the torture of conscious animals, certainly it is the business of this committee to take the necessary steps to that end. I think, in the first place, evidence should be presented to this committee that such torture is being carried on in the District at this time. There are plenty of important things to occupy Congress, without its being asked to legislate unless facts are presented that call for legislation.

Senator GALLINGER. At this point I would ask if you deny that torture is inflicted?

Dr. STERNBERG. I do not deny that torture may have been inflicted. I wish to state that I believe torture is inflicted, but not by scientists. This is what I object to in this bill: It proposes to supervise the scientist in the experiments he makes, while the farmer may apply a clamp to the most delicate organ of his colt or calf and there is no restriction. The veterinary surgeon is not restricted in any way in performing any operation on the horse. If any legislation is enacted against the torture of conscious animals, it should include all animals.

Senator GALLINGER. At this point, Doctor, let me ask about Dr. Rauterberg, from whom I read a letter charging that cruel experiments were performed some years ago in the Surgeon-General's Department. What is Dr. Rauterberg's standing in the profession?

Dr. STERNBERG. I have no knowledge of Dr. Rauterberg.

I would say with reference to myself that I have been Surgeon-General of the Army of the United States for three years. During that time I am positive no such experiments as are specified in the bill have been made without the use of anæsthetics. The whole proposition is someting new to me, and the matter should be investigated before we accept it as evidence. I would say that the laboratories of the Surgeon-General's Office are open to inspection. If any reputable person in the city desires to visit our laboratories and see what is done there, he will not be refused. There is nothing to be concealed.

As to those cruel experiments, accounts of which Mr. Perry spoke of and in regard to which he read a cutting from a physiological journal, I would say that I have not seen the papers; but, in the first place, I do not believe that any surgeon or experimenter would think of making such an experiment without the use of anæsthetics. In the second place, the spinal cord is not sensitive. This idea that pain increases from the extremities of the nerves up to the brain is a fallacy.

Senator BACON. Have you demonstrated that by experiments upon yourself?

Dr. STERNBERG. We have plenty of evidence. I do not think it necessary to make an experiment upon myself. I have run my probe into a brain to see if it could be felt. There is no sensitiveness of the spinal cord.

Senator GALLINGER. To what extent would you carry that? Do you mean to say that an injury to the spinal cord would not produce pain?

Dr. STERNBERG. If you had pressure upon the spinal cord it would produce paralysis and prevent the feeling of pain.

Senator GALLINGER. But unless that paralytic condition were produced, there would be pain, would there not?

Dr. STERNBERG. I think not. I simply say, Mr. Chairman, that these horrors that are spoken of I have never seen. With reference to the Government laboratories, Mr. Perry takes the position that there must be something horrible that we want to cover up. I say that we have nothing to conceal, but we object to this legislation just as much as the Treasurer of the United States would object to having the Commissioners of the District of Columbia send a representative to count his money for him. We object to having our laboratories placed under the inspection and direction of the Commissioners of the District of Columbia, but it is not because we are doing anything that we are ashamed of doing.

Senator GALLINGER. Do you object to the Surgeon-General's Office being subject to the provisions of the law or being subject to inspection?

Dr. STERNBERG. We object to this bill.

Senator GALLINGER. You do not answer my question. I want to know whether your objection is to the law itself, or only to so much of the law as will make your office subject to inspection.

Dr. STERNBERG. Well, we do not consider any legislation necessary. We contend that there is nothing being done in the Government laboratories of this city which calls for legislation, and we will be glad to prove that to the satisfaction of the committee.

Now with reference to the conference upon the bill before the District Commissioners. Both Dr. Woodward and myself thought there was no

necessity for legislation, and so said. But at the second meeting I submitted a draft of a bill prohibiting vivisection experiments in the public schools, but it was not acceptable to Mr. Macfarland. I finally sent that draft to the Commissioners.

With reference to the question as to the necessity for legislation of this character here in the District of Columbia, I desire to call your attention to what the Society for the Prevention of Cruelty to Animals in the city of New York thinks about this. This is an extract from a journal called Our Animal Friends, which is the official organ of the American Society for the Prevention of Cruelty to Animals:

During the long experience of our society it has been found that nothing obstructs our work more surely than attempted needless special legislation, and it rarely happens that a session of the legislature passes without the introduction of some well-meant bill, the only certain effect of which would be to weaken, and not to strengthen, the present excellent laws for the protection of animals. The bill above quoted is distinctly of that class; and we shall now proceed to show (1) that the evil which it is intended to correct does not exist in this State; (2) that the existing law is amply sufficient to prohibit its introduction and to suppress it if it should be introduced, and (3) that the bill, if it should be enacted, would have no other effect than to weaken the provisions of the present law in this very matter of vivisection.

Since November last we have had repeated statements made to us that vivisection has been practiced in three of the public schools of the State. These three are the only schools against which the charge has been brought. In one of them the evidence is so absurdly self-contradictory as to prove the whole story to be a mere canard, and an investigation into the other two has proved the charge to be equally unfounded. The principal of one of the schools writes in the following explicit terms, "Vivisection never has been and never is likely to be practiced in our school;" and the principal of the other writes, not less explicitly, "No demonstrations or experiments upon living animals have ever been performed here." As these are the only schools in which so much as a rumor of the practice of vivisection has reached us, and as we believe it would not be possible for that practice to be introduced into any part of this State without some report of it reaching the office of our society, we feel ourselves at liberty to affirm with confidence that vivisection is not practiced in the public schools of the State of New York. It follows, as a matter of course, that no law is required for the suppression of a practice which does not in fact exist.

Our next point is that the present general law of the State is amply sufficient for the suppression of the practice if it did exist. Section 655 of the Penal Code enacts that "a person who * * * tortures * * * or unjustifiably injures, maims, mutilates, or kills any animal, whether wild or tame, * * * or who willfully sets on foot, instigates, engages in, or in any way furthers any act of cruelty to any animal, or any act tending to produce such cruelty, is guilty of a misdemeanor." In order to exclude the plea that vivisection is not "unnecessary torture," and does not constitute the misdemeanor of "cruelty," the tenth section of chapter 375 of the laws of 1867 distinctly restricts the practice of vivisection to one single class of persons, and regulates the conditions under which alone it may be practiced.

The language of the law is this: "Nothing in this act contained shall be construed to prohibit or interfere with any properly conducted scientific experiments or investigations, which experiments shall be performed only under the authority of the faculty of some regularly incorporated medical college or university of the State of New York." Only under the authority of an incorporated medical school or university can vivisection be practiced in this State, and, since the "authority" of these institutions does not extend to any other school, nor to any person whomsoever not belonging to such organizations, it follows that neither a public-school teacher nor any other person not belonging to some incorporated medical school or university, can practice vivisection under our present law without committing a criminal misdemeanor for which he may be punished. The enactment of any new law to prohibit what the present law sufficiently prohibits would be mere surplusage.

But it would be worse than surplusage, for it would be more than likely to unsettle the present law by raising doubts of its construction, and consequently of its application in cases concerning which there is no present dispute. At present no one pretends, nor can pretend, that any person not acting under the authority of a medical college or university can lawfully practice vivisection in this State; but if the first section of the proposed bill should be enacted what would be the effect? Since it forbids public-school teachers to practice vivisection only in the presence of their scholars or other minors, would it not be reasonably inferred that such teachers are henceforth to be at liberty to practice it, provided only that their scholars or other minors are not present? We do not say that the inference would be justifiable nor that the courts would ultimately sustain it, but what we do say is that the

enactment of the proposed bill could have no other effect than to unsettle the construction of a law which is amply sufficient, and concerning the construction of which there has hitherto been no question.

Another not less undesirable result might follow the enactment of this superfluous and wholly unnecessary bill. Besides the public schools of the State, there are many hundreds of private schools, which are not included in the scope of the bill. Suppose the teachers of those schools should contend that a law which forbids vivisection only in public schools is clearly not intended to apply to private schools, and should thereupon proceed to introduce vivisection into their course of instruction in physiology? Again we say that we do not believe that such a contention would be ultimately sustained by the courts; but we do say, as before, that a merely superfluous law would have the effect of bringing the present unquestioned law into dispute.

For these reasons—because the nefarious practice of vivisection in the public schools does not exist in the State of New York; because the present law is amply sufficient for its suppression if it did or should exist; and because the only effect of the proposed law, so far as vivisection is concerned, would be to bring the present law into doubt, and so to weaken its efficiency. Therefore, we are constrained, with entire respect for the promoters of the measure, to hope that it may not be passed by the legislature.

On the subject of the dissection of dead animals, or parts of animals, in schools we are not called to speak. That subject belongs exclusively to parents and educators. Our work is the protection of living animals, not the use which may be made of their dead bodies. Nevertheless, since the killing of animals for the purpose of dissection is included in the proposed bill, and since the law forbids the "unjustifiable killing" of animals, as well as cruelty to them while alive, and our society is as much bound to prevent unjustifiable killing as to prevent cruelty, we may permit ourselves to say a word on this subject also. The question is whether the humane killing of an animal for dissection is "unjustifiable," and the answer must be that it is not necessarily unjustifiable. If the dissection is lawful and beneficial to human beings, then it is as justifiable to kill an animal for that purpose as to kill it for food.

Now, no one pretends that the dissection of a dead animal is wrong per se; consequently the whole question turns on the right or wrong of dissection in schools; and here we would advise the friends of the proposed measure not to be too precipitate, less they injure the very cause they have at heart. We agree with them that even the dissection of dead animals in schools for young children is utterly useless, and even harmful; but we do not believe that public opinion will sustain a measure forbidding all dissection in schools of an advanced grade. There must be some discrimination, or the whole movement will presently be discredited as a piece of theoretical legislation, unworthy of respect or obedience. Something, too, we submit, must be left to the discretion of teachers, who are the best judges of the sort of instruction which is adapted to their pupils. This, however, as we have said, does not belong to our special responsibility, and we gladly leave it to those who are most concerned.

Now, I do not doubt that cruel experiments have been done at times, but I do believe that the medical profession can be trusted to administer an anæsthetic whenever it may be necessary. To say that the scientist must give an anæsthetic seems to me to be offensive legislation. You do not say to the sportsman that he must administer an anæsthetic when he shoots a bird, nor do you tell the fisherman that he must immediately kill the fish that he catches. A prominent New York surgeon once said to me that he could not bear to go fishing and to play a fish and keep it for half an hour on a sharp hook; it was too cruel.

Senator BACON. Doctor, I want to ask a question for information. I want to know whether the fact that an animal is subjected to ether or chloroform makes the experiment less instructive from that fact.

Dr. STERNBERG. In most experiments it would not.

Senator GALLINGER. Just one other question, Doctor. You spoke of special legislation; in what way do you bring this bill under that term? Special legislation is in contradistinction to general or public legislation. This is for the District of Columbia, is it not?

Dr. STERNBERG. Yes, sir; but this bill does not seem to apply to the general public; it is only for scientists. It strikes me as being class legislation.

Senator GALLINGER. Your idea, then, is that if legislation applies to a profession it is special.

Dr. STERNBERG. Yes, sir; to a profession and not to the general public. I have had no opportunity to look over this modified bill, which is now submitted by the members of the Humane Society, as I understand it, to be substituted for the original bill. The time at my disposal would not permit me to traverse it now, but if you will permit me I would like to submit a statement after having examined that modified bill.

Senator GALLINGER. I am going to take the liberty of printing Mr. Perry's statement before the Commissioners of the District in connection with his remarks here, and your supplementary statement can be printed in the same way.

Dr. STERNBERG. I wish to speak for one moment upon the parliamentary report from which our friends have quoted. As I understand it, a good many opinions were published in that report, among which were many that were not in favor of the conclusions that have been stated here. I think it will be found that a good deal of evidence on the other side was given there. I would say that since the enactment of that law in England much progress has been made in the realms of science all over the world, and England has not had a large share in the progress that has been made with reference to science. Our friends on the other side have brought forward the testimony and opinions of a number of physicians and scientists, some of whom we do not recognize as such great authorities as our friends seem to think. Lawson Tait is a very great surgeon, but in regard to the science of physiology I do not know that he is accepted as such a very great authority.

Senator GALLINGER. I wish to ask a question about Lawson Tait. He is a very distinguished ovariotomist, is he not?

Dr. STERNBERG. I believe so.

Senator GALLINGER. Is it true that his proportion of cures is remarkable—greater than that of any other ovariotomist?

Dr. STERNBERG. I am not prepared to say as to that. His success is due, in my judgment, simply to his thorough attention to details.

Senator GALLINGER. I simply have some knowledge that I have developed from my investigations. I know Lawson Tait has been at outs with you scientists on some points. His record shows that the number of his cures has been large and that he has been very successful as a surgeon.

Dr. STERNBERG. I think at the present time Lawson Tait's methods are practiced all over the world, but he did not develop along other lines.

Senator GALLINGER. Doctor, whom do you desire to follow you?

Dr. STERNBERG. Dr. D. E. Salmon, of the Bureau of Animal Industry, will follow me.

Senator GALLINGER. Dr. Salmon will be heard now.

STATEMENT OF DR. D. E. SALMON.

Dr. D. E. SALMON. Mr. Chairman, one of my principal objections to this bill is that it proposes to limit scientific investigation and education.

I want to say, from my knowledge of the movement to secure legislation to stop vivisection, that the object aimed at is to stop all experiments. The advocates of it are willing to take what legislation they

can get to begin with, but they will not be satisfied except with legislation that will stop all experimenting. If these people here to-day in favor of the bill will speak their honest minds upon this subject, I am satisfied they will say the same thing. Now, the bill which was introduced—the bill which we have in the Senate here—is the only bill which we can discuss intelligently.

I assert, as one who has been engaged in investigations of this class, that it is impossible to carry on experiments of any kind under that bill. I believe it was drawn with the intent and purpose of absolutely stopping all investigation and experimenting.

Now, I want to just say a word as to what vivisection is. We talk a great deal about vivisection, and those who have discussed the question have been very eloquent, but it is very difficult to know what they are talking about. If you will examine this bill now before the Senate you will find that it does not speak of vivisection, but of experiments upon living animals. And when the term vivisection is used it includes all experiments upon animals whether they involve cutting or whether they do not.

Senator GALLINGER. Dr. Salmon, could you inform me as to the relative mortality in the so-called zymotic diseases between ten years ago and the present time?

Dr. SALMON. There is a very great difference in some diseases and not in others. I have no statistics with me on that point. With diphtheria it has been demonstrated by statistics that the intelligent use of antitoxin has reduced the death rate more than 50 per cent.

Senator GALLINGER. Is that not denied by leading physicians?

Dr. SALMON. Yes, sir; everything is denied.

Senator GALLINGER. Is it not true that the beneficial results of antitoxin are open to serious question to-day?

Dr. SALMON. Well, as to diphtheria I can prove by statistics the value of treatment with antitoxin.

Senator GALLINGER. For the benefit of the committee will you kindly tell us just what relation there is between vivisection and the discovery of antitoxin.

Dr. SALMON. Without vivisection it would have been impossible to have discovered antitoxin. In the first place they could not have discovered the germs of diphtheria without vivisection, and every step in the study of immunity and in showing the curative effect of antitoxin was dependent upon such experiments.

Senator GALLINGER. Is the committee to understand that you are opposed not only to the original bill but also to the so-called amended bill? In other words, are you opposed to any legislation?

Dr. SALMON. I am opposed to any special legislation on this subject.

Senator GALLINGER. Dr. Stiles will be heard next, and then the hearing will be closed by Dr. Leffingwell, of Boston.

STATEMENT OF DR. CH. WARDELL STILES,

Zoologist of Bureau of Animal Industry and Correspondant Etranger de l'Académie de Médecine (France).

SUMMARY.

I. The opinions which investigators in medical and biological sciences have expressed upon the subject of vivisection should be given more weight than the opinions expressed by practitioners and medical students not especially trained in research work (p. 55). Submission of printed "Statement in behalf of science," with introduction by the presidents of Harvard University, of the Massachusetts

Institute of Technology, and of the Massachusetts Medical Society, and signed by forty American investigators and teachers in medical and biological sciences (p. 56). Address on the same subject by A. L. Loomis, M. D., LL.D. (p. 61). Resolutions adopted by the Congress of American Physicians and Surgeons, 1894 (p. 87). Resolutions concerning Senate bill 1552, passed by the Joint Commission of the seven Scientific Societies of Washington, D. C. (p. 88). Editorial on Senate bill 1552, printed in the Medical News (p. 88). Editorial on Senate bill 1552, printed in the American Medico-Surgical Bulletin (p. 89). Extract of article in the Journal of the American Medical Association (p. 91). Discussion of the bill by Dr. Busey, president of the District Medical Society (p. 91). Letter by Dr. D. E. Salmon, Chief of the Bureau of Animal Industry (p. 96).

II. The use of names of physicians by the antivisection agitators (p. 98). Submission of letter by Dr. Dawson, stating that his name is being used without his consent (p. 98).

III. Discussion of the bill (p. 99). Section 1: The use of the term "*vertebrate*" in this and other sections; cold-blooded vertebrates should not be placed in the same category with the warm-blooded vertebrates (p. 99). This is class legislation, directed against science, but exempting sport (pp. 99–100).

Section 2*a* prevents the confirmation by scientists in this District of discoveries or alleged discoveries made elsewhere (p. 100); it prevents our repeating an experiment for our own knowledge and experience (p. 100); the term "physiological" is altogether too narrow, the word "biological" should be used in case this section stands (p. 100); the last half of the paragraph seeks to divorce abstract science from applied science, which is contrary to experience (p. 100); citation of the history of trichinosis in opposition to this clause (p. 100).

Section 2*b* together with section 4 is class legislation in favor of doctors of medicine and doctors of veterinary medicine and against candidates and graduates in science and philosophy (p. 101); the sections are based upon an ignorance of the training in different departments of science (p. 101); it affects certain specialists in the employ of the Government (p. 101); it will be a great disadvantage to university students who are doing advanced work in biology, physiology, pathology, bacteriology, and who are candidates for degrees (p. 101).

Section 2*c* excludes valuable experiments (p. 101); a law to compel vivisectors to use anæsthetics is as uncalled for as one compelling surgeons to use anæsthetics (p. 102); the provision regarding surgical operations is almost prohibitory (p. 102); the former occurrence of cruel experiments in foreign countries has no bearing upon the case in hand (p. 102); vivisectors are more sensitive to the sufferings of man and animals than are the antivivisectors.

Section 2: This provision is always carried out, hence no call for legislation (p. 102).

Section 2*e*: No vivisection is going on in the public schools, hence no call for legislation upon this point (p. 103). Submission of letter by Mr. Hay, of the Central High School (p. 103), and Professor Powell, superintendent of the Washington schools (p. 103); the term "public schools" is given a new meaning in this bill (p. 104); second paragraph is not called for (p. 104); the provision of the third paragraph should be left to the decision of the investigator (p. 104); the next paragraph is based upon sentimentality and ignorance (p. 104); no public exhibitions take place (p. 104).

Section 5 would lead to the premature publication of half-finished experiments, and is unjust to science and to the public (p. 104); experiments are published in final reports (p. 104).

Section 6: Protest against inspection, reasons being given (p. 104); dangerous to operator, might result in pain to the animal. No provisions as to the qualifications of inspectors are specified; comparable to an inspection of the private sick room.

Section 7: Another case of class legislation direct against biologists (p. 105); dangerous delays in cases of hydrophobia and glanders (p. 105).

IV. Investigations in the Bureau of Animal Industry in which animal experimentation has been used (pp. 105–107).

V. Report of the Boston hearing, which bears directly upon many questions connected with the present bill. (Manuscript has not yet been received.)

Dr. STILES. In the first place, I wish to submit that the question of vivisection is not one to be decided by counting noses, even by comparing the number of physicians who favor vivisection with the number of physicians who are opposed to it. While there is no doubt that if this question were submitted to a vote of the medical fraternity at large the vast majority would favor vivisection, it is equally certain that a clear distinction should be made between the opinions expressed by men who are engaged in research work and in teaching, and the opinions expressed by those medical students and practicing physicians who

have never entered into research work and who, whatever may be their ability as practitioners, are not accustomed to the conditions governing investigations.

The investigator is thoroughly at home in the particular subject he is studying; he knows the history of that subject, the failures and successes of former investigators, the necessity of exact methods of work, the chances for error, the exacting demands which science makes for the minutest details, etc. After he has completed his investigations, he draws his general conclusions from the detailed data at hand, including not only the results obtained from his own experiments and personal experience, from published text-books, and from the more popular medical journals, but also from the detailed accounts of the experiments of other workers, published in the special journals devoted to his particular branch of work, which are read by the practitioner only in exceptional cases.

The practicing physician, on the other hand, takes the general conclusions reached by the investigators, rarely suspecting the minute details which have been considered in drawing those conclusions. Nor is this in any way a reflection upon the ability of the practitioner, but rather a necessary result of the difference in training which these two classes of men undergo. The physician has been trained in general principles, diagnosis, and treatment; the investigator has been trained not only in general principles, but also in the details upon which these general principles are based. I therefore maintain that the opinions which investigators have expressed upon this subject should have much greater weight than the opinions which you have received from any number of practicing physicians, no matter to what school they belong or from what college or university they have been graduated; and as an offset to any adverse opinions which may have been sent to your committee by noninvestigating practitioners, even of the highest standing, I desire to call your attention to the various memorials and protests which have been forwarded to you, signed by practical investigators, and to submit the following printed statement, signed by 40 American investigators, as representatives of various American scientific and medical societies and services:

BOSTON, *February 24, 1896.*

The sciences which have to do with animal experimentation are physiology, physiological chemistry, pharmacology, medical chemistry, toxicology, morphology (including anatomy and embryology), bacteriology, pathology, medicine, and surgery. These sciences are largely represented in this country by the American Physiological Society, the American Society of Morphologists, the American Anatomical Society, the American Society of Naturalists, the American Society of Physicans, and the American Society of Surgeons.

In December last the presidents of the above societies were invited to appoint members of a joint committee to sit in Philadelphia on the occasion of the annual meeting in that city of several of these associations.

The accompanying "statement in behalf of science" was adopted by this joint committee of thirty-four members, and is now published over their signatures, with the addition of several names of persons specially qualified to speak on the subject, but not members of the committee. It sets forth the importance of animal experimentation for the advancement of medicine, and may be accepted as an authoritative expression of expert opinion on this question.

CHARLES W. ELIOT,
President of Harvard University.
FRANCIS A. WALKER,
President of the Massachusetts Institute of Technology.
FRANK K. PADDOCK,
President of the Massachusetts Medical Society.

"Vivisection."—A Statement in Behalf of Science.

So long ago as the autumn of 1866 there were published in New York denunciations of the practice of making upon living animals those scientific observations and experiments which are commonly called vivisections. During the following twenty-nine years there have appeared, from time to time, at one or another place, similar denunciations, more or less sweeping and violent. Of these some condemn vivisection altogether and others in various of its phases. Some call for its total abolition and others for its material restrictions. Some are labored essays and others are brief "tracts" or "leaflets," intended more easily to arrest the attention. Most of these publications, however, have this in common, that they seek to fortify argument with strenuous appeals to emotion, and in some the tone of invective rises to a shrillness little short of frantic. In these publications, too, there often figure extracts from scientific writings; and, in many cases, these extracts are so garbled that only ignorant or reckless animosity could be accepted in excuse for their seeming bad faith.

During the past twenty-nine years these attacks have but little disturbed the calm of biology and medicine in this country; but, from time time, it has seemed wise to take some notice of them, inasmuch as the common sense of some members of a changing community is liable to be led astray as to a subject which is largely technical in its nature. The following statement, therefore, is added to its predecessors. Its signers, however, are well aware that they can hardly hope to make any statement or to draw any conclusion which some antivivisectionist agitator will not promptly denounce as false or immoral.

Science is simply common knowledge made precise, extended, and transmitted from generation to generation of trained observers and reasoners. The biological sciences study in the most varied ways the bodies and the lives of men, of animals, and of plants. The applied sciences utilize knowledge thus obtained for the every-day good of mankind, and one of these applied sciences, medicine, brings biological discoveries to bear upon the prevention and cure of disease and injury. As experience grows incessantly, the fact which has laboriously been established with no other thought than the noble one of advancing knowledge may be applied, the next day or the next century, in the most practical way by some inventor or physician, and in the application new facts may come to light which will markedly extend the boundaries of knowledge.

Therefore, in the slowly woven fabric of achievement, pure science and applied science, biology and medicine, have always been warp and woof. Let either be destroyed, man's life shall go threadbare.

To show this, a few out of many striking examples may suffice.

Not very long ago the red clover was imported into a British colony to which it was not native. The plant throve when planted, but its flowers set no seeds, so that fresh seed had to be brought from the mother country. The disappointed farmers consulted people who had given up their time to the study of plants and insects—botanists and "bug hunters," in fact. Pure science told the practical farmers that the long-billed humblebees which sucked honey in every English clover field also carried pollen from flower to flower, and thus fertilized the plants, and that it was useless to try for crops of imported red clover, unless humblebees were imported also.

No less enlightening is the history of one of the greatest and most modern of the developments of science. Near the end of the last century Dr. Galvani, an Italian professor of anatomy, set himself to investigate the cause of a newly discovered fact, namely, that the muscles of the legs of freshly killed frogs jerked forcibly when their nerves were worked upon by the taking of a spark from an electrical machine. This investigation, which does not sound momentous, he undertook "in order to discover the hidden properties" of the nerves and muscles "and to treat their diseases more certainly." To the jerks of Galvani's frogs' legs we owe the discovery of the galvanic battery and current, which are named after him; the telegraph and ocean cable, with their immense influence upon civilized life in peace and war; the transfer to miles of distance of the vast working power of Niagara Falls. It is a fitting, if slight, dramatic touch that the traveler in Italy who passes the night at Bologna, where Galvani worked and taught, will perhaps put up at a hotel directly opposite the professor's modest house, and will see that the tablet which records the experiments made within is lighted up at evening by the electric light, which also owes its existence to a search for the hidden "properties" of frogs' legs.

Two hundred years ago there lived at Delft, in Holland, a well-to-do Dutchman named Antony van Leeuwenhoek. He had been a "dry-goods clerk" in his youth, and had no learned or professional training. Van Leeuwenhoek took to making and polishing, for his own use, very small and very strong magnifying glasses, because he was full of what some antivivisectionists sneer at as "scientific curiosity." The

Dutchman's glasses were very superior, and with them he looked at the most miscellaneous things; among these, at ditch water and at particles from the surface of his own teeth. He found that such matters were swarming with living things of many kinds, and described them and other things so well that he became famous; and princes, who were not ashamed to be interested in "mere science," sent for him and his glasses to instruct them. Among Van Leeuwenhoek's discoveries were the minute things now called bacteria, or microbes, and known to be living plants. The physicians were prompt to guess that diseases might be due to the ravages of the new forms of microscopic life first seen with decisive clearness by Van Leeuwenhoek; but no proof of this was forthcoming, and the idea was abandoned by most, amid the laughter of many at this fad of the doctors. More than a century went by. The bacteria, as objects of pure science, were more and more studied. The microscope was bettered more and more from the simple magnifying glass of Van Leeuwenhoek. With the advance of chemistry and of other sciences all known means of studying minute living things became greatly improved; and now the idea that many diseases were caused by minute living things was taken up afresh and carried to triumphant demonstration by a number of medical men and biologists, among the latter by Pasteur, whose recent loss is mourned by the world, and whom an eminent American humanitarian sneered at, not many years ago, as an "obscure druggist." The proof that many diseases are caused each by a particular kind of microbe was obtained by vivisection; for the proof consisted in inoculating animals with the special microbe in question, to the practical exclusion of others, and noting that the animals took the disease, perhaps died of it. As some only of the results of the knowledge thus gained by experiment upon animals, it may be noted that the prevention of cholera has been made more certain, and that great numbers of patients, largely children, have been saved from death by the antitoxine treatment of diphtheria. But every child thus saved to-day owes his life not only to medicine, but to biology; not only to the observations and the vivisections of Klebs and Loeffler and Koch and Pasteur and others, but to the "mere scientific curiosity" of that old lens polisher of Delft, who spent time in prying into ditch water and particles from the surface of teeth.

Early in the last century, at a country parsonage in England, there worked a pious and gifted man, the Rev. Stephen Hales, D. D., rector of Farringdon, in Hampshire. Dr. Hales achieved the uncommon distinction of becoming both an excellent clergyman and a famous biologist. Nor was it to any easy branch of observation that he gave such time as he could spare, but to difficult themes of experimental physiology, both vegetable and animal. He studied, among other things, the pressure of the sap in plants and the pressure of the blood in the vessels of animals. In order to investigate the blood pressure, he did a number of indispensable vivisections upon horses, sheep, and dogs. Each animal was tied down, an artery was opened and connected with a pressure gauge, and the true pressures, and their variations, were for the first time properly observed and recorded. No doubt, had it been possible, the excellent Hales would have drugged his animals to quiet their pain; but modern methods for this purpose were not discovered till long afterwards, so that in those days both man and beast faced the surgeon's knife without such relief as they afford. By the work of Hales our knowledge of the circulation of the blood, which his famous compatriot, Harvey, had discovered, received an essential addition; nor is there any reason to suppose that Hales ever doubted the morality of the proceedings by which he satisfied his "scientific curiosity." Were he to return to life and to repeat his experiments, even with all modern improvements, he certainly would be surprised at the reception he would meet with in some quarters.

Since the time of Hales those changes in the blood pressure have carefully been studied which are produced in various states of the system, and by various drugs. More than a century after Hales, some vivisections were performed by Mr. Arthur Gamgee, to test the effect upon the blood pressure of a certain volatile chemical—the nitrite of amyl. It was found that the pressure appeared to be greatly lessened by this drug. Some of these experiments were witnessed by Dr. T. Lauder Brunton, at that time resident physician to the Royal Infirmary of Edinburgh, and now an eminent medical practitioner and professor in London. During the winter of 1866-67 there were in the wards of the infirmary several patients who suffered from the disorder called breast-pang, or angina pectoris, which is characterized by paroxysms of hard breathing and of terrible pain over the heart. In observing these cases, Dr. Brunton saw reason to think that the attack was accompanied by a high blood pressure in the arteries. He remembered the vivisections in which he had seen the effects upon the arterial pressure of the nitrite of amyl. He caused his patients to inhale a few drops of the volatile drug. The pain generally disappeared, and the nitrite of amyl became very soon a recognized agent for the relief of one of the most acute forms of human suffering.

Every victim of angina, who carries this drug about with him for use at any moment, owes his exemption, first, to the scientific physician; second, to the pharmacologist—that is, the scientific student of the action of drugs, who, for the good

of man, sacrificed animals in studying the effect of drugs upon the blood pressure; and, third, to the clergyman and physiologist, Hales, who a century before had given some pain to animals in studying the science of the circulation, apart from any direct application to the cure of human ailments. Nor is this all; for the experiments of Hales were based upon the knowledge acquired through vivisection by the physician Harvey, who by this means settled much relating to the motions of the heart and blood in animals, which settlement, in turn, depended upon the work of the famous Greek physician, Galen, who seventeen centuries ago proved by vivisections, against his professional opponents, that blood is naturally contained in the arteries.

Of the numerous improvements in practical medicine and surgery, which are the outcome of experiments upon living animals we could not speak at length without expanding a brief statement into a book. We will instance further only the vivisections by which, at the time of the Napoleonic wars, Dr. J. F. D. Jones ascertained the proper way to tie a wounded artery, and thereby afforded the means to military and civil practice of saving very numerous patients from bleeding to death; the experiments of the still living surgeon, Sir Joseph Lister, as the result of which surgery has been revolutionized in our own day; the quite recent vivisections, as the result of which the cure of the disease called myxœdema has been discovered, which cure consists in the administration or transplantation of the thyroid gland; and the vivisections in the seventeenth century relating to the transfusion of blood, as the result of which women in child-bed have repeatedly been rescued from impending death from "flooding after delivery."

Experience shows, therefore, that it is impossible to disentangle pure science from applied science; that vital human interests are benefited by "scientific curiosity," as well as by work more directly practical; and that this general law holds good for those sciences, pure and applied, which deal with man as such, and with the other living things upon the earth. Without physiology, pathology, and their allies, which investigate the laws of life by experiments upon living creatures, practical medicine would be in worse than mediæval plight; for before the Middle Ages the genius of the Greeks had inaugurated the practice of experimental physiology, with results of value for all time.

Therefore the use of animals by mankind for scientific purposes takes its place beside those other uses of them for the good of man which involve imprisonment, enforced labor, death, and, in some cases, suffering. That society asserts with practical unanimity the right to kill and inflict pain upon animals for its own purposes is shown by the legal view of cruelty as the unjustifiable infliction of suffering. Were every infliction of pain as such punishable as cruel, the painful operations, for instance, required to make animals docile, or to fit them to be food, would be abolished. In every great civilized country these operations of the farm-yard aggregate millions in each year.

Happily, of the very various procedures known collectively as vivisections, many are painless; in others the suffering is trivial, whether the animal be killed or remain alive; and in the great majority of the rest some drug may be given to quiet pain, or insensibility may be produced by sudden operation. There remains, however, a limited proportion of cases, which may be of great importance, where the results of experiment would be endangered by any means that could be taken against suffering. In these cases the animal must suffer, though often far less than would be supposed, for the benefit of man, as does the gelded horse or the wounded game.

Common sense requires, therefore, that investigations in biology and medicine shall proceed at the expense, when necessary, of the death and suffering of animals. If these sciences are not to be extinguished, they must be transmitted from generation to generation, they must be taught, and, like all the other natural or physical sciences, they must, at institutions of the higher learning, be taught by demonstration. No one would think favorably of a student of chemistry who had never handled a test-tube, or of a student of electricity who had never set up a battery. The young astronomer sees the stars and planets themselves through the telescope. So do serious students of biology or medicine see for themselves the structure of the body, see for themselves the workings of that structure through the experiments of the physiological or pathological laboratory or lecture room, just as, if medical students, they see disease in the wards of hospitals, and look on or assist at the surgical operations performed upon men, women, and children. No models and pictures can replace such teaching. From this last fact there is no escape. It is rooted in the constitution of the human mind. No mother would knowingly allow her children to ride behind a locomotive engineer who had never seen the workings of an actual engine. Surely, the physician who does his best to guide the living mechanism along the path of safety should be taught its natural workings as exactly and as fully as possible, otherwise he may not understand its workings in disease.

Happily, the cases where the animals seen at demonstrations must undergo more than brief or trivial pain are even rarer than in cases of pure research. In the very

great majority of demonstrations the creatures can be kept free of pain until they are killed. As to whether or no, under given circumstances of research or teaching, an experiment involving pain should be performed, is a matter which should rest with the responsible expert by whom or under whose direction the thing would be done; otherwise, in a matter involving the interest of the community, those who know would be directed by those who do not know. For any experiment improperly conducted, the person responsible is liable under the general laws against the maltreatment of animals. In fact, American biologists and physicians are no more inclined than other members of the community to culpable negligence toward their fellow-creatures. The work of science goes on; but those who are responsible desire, and see to it, that the work be painless, so far as admissible. No intelligent man or woman should give heed to the denunciations of those few ill-informed or headstrong persons who have been drawn into one of the least wise of the agitations which beset modern society.

Signed:

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Signed—Continued.

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HENRY F. OSBORN, M. D., Professor of Biology, Columbia College, New York.

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To this statement I would add the following presidential address by A. L. Loomis, M. D., LL. D., delivered at the third meeting of the Congress of American Physicians and Surgeons:

THE INFLUENCE OF ANIMAL EXPERIMENTATION ON MEDICAL SCIENCE.

This third meeting of the Congress of American Physicians and Surgeons is a most memorable occasion, since it has established the success of an undertaking which aimed to unite in one representative body groups of acknowledged experts in all departments of medicine and surgery. It is, however, no longer an experiment, for the record of work done places it high in the list of scientific associations. Its broadening influences upon American medicine and surgery have already been felt and acknowledged. The vast extent of modern medical research, the various objects of separate interest which it includes, and the limitations of human intellect have made it necessary that there should be groups of workers in many different departments.

It is clear that one mind can not advance medical knowledge except by an infinitesimal degree. In ages when strong minds were few and intercourse limited men must needs have been more than human to have accomplished much more than their masters did. For nearly a thousand years the history of medicine may be traced by a few names. Schools were founded on men, not on principles, until loyalty to one's master, the founder of a school, became stronger than truth. Even as late as the sixteenth century Galen, Hippocrates, and the Arabic authorities were the teachers of medicine throughout the civilized world. From the crumbling ruins of abstruse theories and the wrecks of individual systems has become a scientific scepticism, which is to-day the most striking characteristic of medical thought—a scepticism which doubts not for the sake of doubting, but which demands proofs and counter proofs, which scans facts, not men, and which learns to recognize truth, from whatever source it comes.

It is this which is making modern medicine truly scientific and giving to modern investigation an individuality which thinks and decides for itself. It is this spirit, this love of truth, dominating such gatherings as this, which, during the past two decades, has been shaping medical thought and investigation. It is this keeping in close touch with one another's work that is giving to modern medicine its freshness, special activity in investigation and rapid growth, which is inspiring medical workers with a community of thought and action, and which is bearing fruit of the greatest promise. On such an occasion as this, in the presence of so many trained and skilled workers, it seems fitting that I should direct the current of thought to the lines of investigation which have made the discoveries of the last quarter of the nineteenth century possible.

From the beginning of history to the present century medicine has been either absolutely denied a place among the sciences or else branded as inexact, empirical, and laggard in its development and progress. Although dealing, as it does with the most complex problems of human existence, where, as in no other science, every law of nature is controlled and modified by that unknown force we call vitality, medicine has, nevertheless, from the very first, been forced to meet the demand for complete knowledge. To it alone the answer "we do not yet know all" has been denied.

No greater misconception has ever gained footing in the public mind than the belief in disease as an entity—an evil spirit to be exorcised or driven out by drugs. The superficial observer recognizes only results and gross phenomena; he is content with knowing the end, never asking for causes. For him motion and quiescence as shown by his senses are the ultimatum; factors and forces have no place in his mental processes. Yet, these are precisely what science seeks to define, and until he has made the first analysis of terms, established absolute variations of quantity and quality, and determined the fixed ratio of forces, the scientific worker is not content.

In determining then the influence of any one factor in the development of medical science, results can not be measured by the perfection of the whole, but must be estimated solely by the degree of advance toward the completed investigations.

The specific problems with which medical science deals are thus seen to be questions of the relative influence of multiple forces on the production of given results. When Galvani recognized electric force in the twitching muscles of his dismembered frogs and Volta was lead thereby to the development of apparatus for the continuous production of this mysterious agency there was no hint whatever of the far-reaching influence of electricity in modern medicine. Yet history shows that one discovery was the direct result of the other and that every electrical device for the relief of disease has its origin in those quivering batrachian limbs.

Only the deepest ignorance can fail to recognize that the forces concerned in the simplest changes of inorganic nature are so numerous, and their relations so complex, that they defy recognition under uncontrolled conditions, while in the organic world the task is even more hopeless. Experimentation, therefor, in which one or more of the involved forces can be controlled or predetermined and eliminated becomes an absolute necessity in all scientific investigation. However clear the mental analysis, however accurate the logical demonstration from cause to effect, it is possible by experiment alone, under controlled conditions, to prove that no involved force has been overlooked; that the premises were true and the conclusions therefore ultimate. The truly scientific investigator is an analyst and purist, who seeks to establish the values of single in place of combined forces. His results are therefore primarily isolated facts, and their value not immediately evident. Often, indeed, their relations are so remote and their values so contingent upon yet other undetermined truths that they gain but scanty recognition, if, perchance, they are not totally ignored, and finally forgotten. Meanwhile, the brazen dicta of some mere observer, who only sees most superficial relations and blindly accepts an assumed possibility as demonstrated fact, gain unhesitating credence. Yet the scientific experimentator alone adds to our store of knowledge and power for good. He seeks for truth and truth alone. However isolated or unrelated his results may seem he sees in each a potential value. The smallest discovery thus not only has its own peculiar merit, but points the way to other hidden truths, although it may often be difficult to connect the several links in the long chain of progressive knowledge.

The world might still be standing in dumb awe and barbaric fear of Jove's thunderbolts had not Franklin's kite decoyed the blinding force and locked it in his Leyden jar. Thus bound, and under predetermined conditions of action, it was brought within the power of scientific investigation.

Is it not strange that medicine should be denied the right to follow those imperative methods of scientific research which are so unquestionably accorded to every other science?

It has been assumed that the medical investigator finds ample opportunity for experimentation in studying diseases under the ordinary conditions of human life.

Recognition, however, of the fact that experiments are never isolated, but in continuous and consequent series; that unknown quantities are determined, as in solving algebraic equations, by successive eliminations, and that ultimate values are obtained only from experiments involving but a single unknown term, at once indicates how uncertain, and hence valueless, conclusions drawn only from clinical experience must be. If further proof be desired, it is found in the well-known uncertainty and variability of disease processes, and the associated systemic reaction. Scientific experimentation thus demands conditions under which the largest possible number of the involved factors can be controlled or known. For medical science these conditions can only be found in a healthy organism. This science must therefore either stand still or investigate the mysteries of life where life holds its myriad forces in

perfect harmony. Thus, it seeks not primarily to discover cures for disease, but rather to separate the multiple factors of disease and to fix the relations of such factors to the forces under our control by which they may be modified. It is not a little surprising that, with an appreciation of the necessity for experimentation, men should for so long have preferred to be its subjects, and that even to-day so many refuse to yield the place to animals. For example, in widespread epidemics we note the effects of an infection on perhaps half a million of human beings, with a great sacrifice of human life On the other hand, we study in laboratories the cause of the epidemics with comparatively small sacrifice of animal life.

In entering upon the consideration of this subject I fearlessly lay down this proposition, confident that it states your unanimous verdict as representatives of medical science on this continent. That every distinct advance, every established principle, and every universally accepted law of medical science has been in the past and will be in the future the indirect, if not direct, result of animal experimentation. I ask you to review with me some of the more obvious and conclusive proofs of this proposition.

The imperative lines of our investigation may be broadly classed under four heads:

1. Experiments to determine the functions and normal relations of the organs composing the physical economy.

2. The causes of those perversions of function present in the condition designated disease.

3. The nature of morbid processes and the relation of their causes to the consequent systemic reactions.

4. The protective and curative influence upon these processes of agencies under our control.

In this review I shall follow an historical order, and present in an appendix detailed accounts of all experiments to which reference is made.

It is not too much to claim that during the latter half of the present century the results obtained from experiments on animals have done more than all the observations of the preceding centuries to raise medicine from conditions of vagueness to conditions of exactness. From the time of Aristotle,[1] who proved that the blood, brain, and spinal marrow in animals have no sensation, down to the present day animal experimentation has been practiced by all investigators who have gained any definite knowledge of the more important phenomena of animal life.

Galen,[2] however, must always be regarded as the pioneer in this line of investigation. He may be said to have laid the foundation stone of medical science. By his experiments on living animals he showed that arteries contained blood, that the lungs passively follow the movements of the chest, and that the diaphragm, although the most important, is not the only muscle of respiration. Furthermore, by section of the spinal chord and the recurrent laryngeal nerve, he demonstrated the nervous control of the voice and explained the mechanics of respiration. By various methods he greatly advanced the knowledge of the structure and functions of the alimentary canal, demonstrated the movements of the stomach and the peristalsis of the intestines, and laid the foundation of our present extensive knowledge of the functions of the brain and spinal chord. The results of his experimental work are "as conclusive now as when he first made them, and retain to-day their full value"; in fact, they are the only part of his vast labor which has stood the test of modern investigation. The knowledge of the circulation and respiration which was gained by his experiments on animals in the second century was the foundation and a necessary preliminary to Harvey's complete discovery of the circulation, in the seventeenth century. His experimental labor was the only work that survived the fluctuating medical systems of the Dark Ages, with perhaps two exceptions, viz: First, Vesalius,[3] who in the sixteenth century created for medicine a solid foundation by transforming anatomy into an exact science, found that the action of the heart might be continued for some time by inflating the lungs of animals with air after the chest cavity was opened, and published in 1543 his discovery of artificial respiration. Secondly, R. Columbus,[4] in 1559, by direct experimentation on living animals, discovered the pulmonary circulation. In fact, from Galen's time till Harvey's great discovery, with these exceptions, little experimental work was done, and during most of this period medicine, instead of advancing toward a science, became more and more the plaything of theorists and impostors.

Harvey,[5] following the practice of Vesalius and Columbus of making anatomical examinations of the living parts according to experimental methods, established, in 1620, his great doctrine of the circulation of the blood. As it has been frequently denied that his discovery rested entirely on animal experimentation, I have given in the appendix his own quaint and detailed account of it, which I am sure is quite enough to silence all question on this point. By a long series of carefully conducted experiments on animals, and by that alone, he unraveled the system of the circulation and established a discovery which more than any other influenced the future of medicine and surgery. It needed only the microscopic demonstration of

the capillary circulation by Malpighi,[6] and his demonstration of the circulation in the lung of a living frog, to make the solution of the great vital problem complete.

The next series of important and epoch-making experiments on animals were applied by Galvani[7] and Volta[8] to the nervous system. Each investigator was in error in his explanation of the results obtained by his researches, but their great discovery was not lost on account of the wrong interpretation which they gave to it, for their experiments on the electric condition of the nerves and muscles of animals established an epoch in the history of the physiology and pathology of the nervous system which led to brilliant results a century afterwards.

The first attempt to continue life for an indefinite period by artificial respiration was made by Robert Hook[9] in 1664. He showed that "by inflating the lungs of animals with a bellows and then allowing them to collapse, an artificial respiration might be established which could be kept up for a long period." Artificial respiration, according to Hook's method, was afterwards practiced by Brodie[10] and others for the purpose of studying the action of the heart and blood vessels, and for resuscitating asphyxiated animals. The principle established by these experiments on animals was later applied to the human subject, and is now a recognized means of preserving life in cases of asphyxia and of resuscitating the newly born.

The countless experiments on living animals, carried on during the seventeenth century in all the medical centers of Europe, on the action of the heart, the circulation, absorption, secretion, and respiration produced a fund of knowledge without which the brilliant advances of the eighteenth century would have been impossible.

By experiments on birds, frogs, and insects, Boyle,[11] near the close of the seventeenth century (1670), showed that atmospheric air is necessary to the maintenance of life, as he found that air which had been breathed by animals for some time became finally unfit for respiration, so that the animals died.

Priestley[12] continued Boyle's experiments on air vitiated by respiration, establishing the fact that by growing plants in the vitiated air it becomes regenerated and is again fit to breathe. It remained, however, for Lavoisier,[13] following Hook's and Priestley's experimental methods, to establish at that time the true composition of atmospheric air and to develop the real basis of respiration, viz, the absorption of oxygen and the exhalation of carbon dioxide. This discovery opened an entirely new field in the study of respiration, and laid the foundation of our present knowledge of the respiratory processes.

The injection of fluids into the blood vessels of animals was first performed by Dr. Christopher Wren,[14] of Oxford. He employed an infusion of opium, and produced narcotism in the injected animals. His experiments in this line were soon followed by those of Richard Lower,[15] who, in 1666, performed the first transfusion of blood in animals, and the following year Dr. Denis[16] performed the same experiment on man. Mr. Boyle[17] afterwards elaborated the method of transfusing blood from one animal to another, and showed that death from hemorrhage might be prevented by such transfusion. These experiments led later to the establishment of the practice of transfusion for certain conditions of bloodlessness, a principle which to-day occupies a prominent place in life-saving methods.

After Galen's experiments on the nervous system of animals the labors of investigators were chiefly confined to anatomical studies of the nervous system, and little or no advance was made in the knowledge of its function until the middle of the eighteenth century, when Haller proved, by numerous experiments in cutting and irritating nerves, "that all motion in the human body proceeds in a great measure from the brain and its annexed cerebellum and spinal marrow." He also demonstrated that when the peripheral end of a severed nerve is irritated the muscle to which it is distributed contracts. Soon after, Sir Charles Bell[18] commenced his experiments on the spinal cord and nerves of animals in order to determine the function of the cerebrum and cerebellum, but after long labor reached no satisfactory result. Ten years later, however, while experimenting on facial nerves, in his attempts to demonstrate the existence of a great system of respiratory nerves separate from those of sensibility and voluntary motion, he established the important fact that the seventh cranial nerve is a nerve of motion, and the fifth a nerve of sensation. This discovery has been fruitful of practical results both in medicine and surgery.

Although Bell did not believe in animal experimentation as a source of knowledge, and employed it only to prove or confirm his anatomical studies, nevertheless his experimental work is the only part of his labor which has remained. The classifications and fascinating theories which he so ingeniously constructed on the basis of his anatomical studies are hardly known to neurologists of the nineteenth century.

Magendie[19] inaugurated the present century by a series of most brilliant experiments. He recognized the dangers of adopting theories based on imperfect knowledge and devoted himself accordingly to eliminating these imperfections by experiments on living animals. "The love of knowledge for its own sake was the impulse which dominated all his work. He claimed that all science was inductive and con-

sequently founded on experiment, and maintained that the science of life necessitated animal experimentation."

By a series of carefully conducted experiments on the spinal cord, in which he divided successively the anterior and posterior roots of the spinal nerve, he demonstrated the difference between the motor and sensitive nerve roots. In this way the distinct endowment of the two kinds of nerve fibers was established. Once placed on this footing the study of nerve physiology was greatly increased in efficiency and extent. Thus, by applying the galvanic stimulus to a spinal nerve above and below the point of section, its mode of action was determined by the excitability of its motor and sensitive fibers. He employed the same methods in the study of the cranial nerves, both externally and at their roots. In fact every branch of inoculation was scrutinized by the same means.

It is hardly possible to estimate the importance of the change thus introduced into the study of the functions of the nervous system and the facilities which were thus supplied for further investigation. "This distinction between the spinal nerve roots was of the utmost importance, for it indicated a general plan of arrangement for the nervous system throughout the body. It became immediately a subject of criticism and verification for all the leading investigators of Europe and the result was a complete acceptance of Magendi's discovery." Magendi not only cleared up much that was vague and uncertain in the physiology of the nervous system, but he established methods of experimenting on the action of medicinal agents, and was the first to demonstrate conclusively that "poisons act on the spinal cord through the circulation, and not by means of the lymphatics and nerves." His results, obtained by experiments on animals with strychnine, quinine, iodine, and a long list of medicinal substances, enabled him to lay the foundation of the doctrine that remedies exert their special action upon special structures and organs, a doctrine which was afterwards further developed by Claude Bernard, and is now the accepted view regarding the action of all medicinal agents. He further demonstrated so thoroughly and clearly the action of strychnine on the spinal cords that subsequent investigations have added but little to his results.

Magendie entered upon the investigation of all subjects with a sort of skepticism that demanded proof and counterproof. In his studies of the functions of organs he was forced to experiment on animals, and we may rightly regard him as the originator of the modern system of animal experimentation. Following the path which his great teacher had made so brilliant, Claude Bernard,[20] by dividing the sympathetic nerve in the neck of the rabbit, observed that the blood vessels in the ear of the corresponding side became enlarged, and demonstrated by a series of similar experiments that the size of the blood vessels is under the control of particular nerves which cause them to contract and dilate.

I demand from all opponents of animal experimentation recognition of the following fact. In all this long list of investigations not a single experiment was directed immediately to the discovery of a cure for a disease, but solely to the determination of physiological functions and the normal action of the vital processes, as indicated under the first head of our classification, and to defining the specific influence of given substances upon healthy living organisms, as indicated under the fourth head of our classification. It would have been impossible at that time even to guess just what valuable results were to come from these discoveries. Yet these experimentators fully understood, what everyone must understand who expects to comprehend the purpose of medical science, that the practice of medicine is by principle and not by precept. Each worker recognized that the truth he sought was only a part of medical science and each by his discoveries marked an epoch in that science.

It were a task for days even to tell the things we are now able to do upon the basis of Bernard's discovery of the vasomotor nerves, and the story of the specific action of drugs is no shorter. It is probably a conservative statement to say that, excluding the medicinal foods, 90 per cent of all our medication is made definite and valuable by this principle alone, which occupies the same position toward medicine as does Newton's law of universal attraction toward physics.

Although Brodie[21] had done much experimental work on the action of medicines without reaching any satisfactory results, it was not until Claude Bernard applied his experimental methods that the true action of drugs was fully understood. His work on digitalis offers a most excellent illustration of the relative values of the experimental and clinical methods of study. Numerous observers had previously recognized that digitalis made the heart's action slower, and therefore regarded it as a cardiac sedative. This conclusion Bernard proved to be the direct opposite of the truth, showing by experiments on animals, in which the drug was the only disturbing force, that its effect is not sedative, but, on the contrary, stimulating and tonic, rendering the action of the heart more powerful and increasing the tension of the blood vessels. The rules for its use in disease were thereby revolutionized, and the results obtained by the use of this drug in so many diseased conditions were for the first time made certain. The necessity of investigating the action of drugs upon

animals, in which the experiments could be controlled and varied, was thus conclusively proven by Bernard's work; and his methods were soon adopted by other investigators, by whom our knowledge of the action of remedies has been made definite to a degree that could never have been attained by mere observations of their effects upon man.

Thus modern therapeutics, emancipated from the bondage of empiricism, stripped of its chains, in which every link of personal interpretation differed from its fellows, no longer wounding friend as well as foe by aimless blows in the dark, stands forth a young but growing Hercules, bearing in place of the old barbaric club a magazine rifle with telescopic and microscopic sights, the ammunition box of which holds not drugs alone, but a manual of directions, wherein are written the truths which our modern priests, offering sacrifices on the altars of science, have given to mankind to save them from their infirmities.

Still the tale goes on: Magendie, Bernard, and Longet established by their experiments the doctrine of recurrent sensibility, which was followed by the great discovery of Marshall Hall[22] of the reflex action of the spinal cord. He observed that after the removal of the brain in animals the limbs were still capable of motion; and he showed by further experiment that the spinal cord acts independently of the brain as a medium of communication between the integument and the muscles. The same form of activity was afterwards found to be very widely extended in the nervous system. Legallois[23] and Flourens[24] showed that the medulla has its own centers of reflex action, and is either directly or indirectly an essential to the continuance of life.

There is to-day no more important department of nerve physiology than that in connection with the vasomotor nervous system. It has been studied and developed by many observers, but, as just mentioned, was practically established by Bernard's experiments. It solved not only some of the most important and difficult problems of physiology, but made intelligible many unexplained pathological changes. The relation of disturbances of the surface circulation to diseases of the internal organs; the mechanism of local congestion; the recovery of nerves from the exhaustion of over-stimulation by rest; the varying effects produced by different kinds of electric stimuli, and much similar knowledge, mark the fruit of a long series of experiments made along the line so clearly marked out by Bernard. Each one of these series rested on the work of some preceding experimenter; together they form a continuous line of development which can be traced directly to the work done in Galani's laboratory in 1789.

We turn now to experiments falling more directly under our third class. It is extremely suggestive as well as interesting to note that the order in which these discoveries came most clearly indicates that all investigators were working toward the relief of human suffering as their one great object. Anatomy and physiology could not be ignored, but pathology and etiology were forced to give place to therapeutics.

John Hunter[25] in 1785, by his experiments on the arteries of dogs, established the fact that injuries to healthy arteries were soon repaired, and that ulceration of arteries after ligature only occurred in such as were primarily diseased at the point of ligation. These experiments led him to apply the ligature, for the cure of aneurism, to the healthy portion of the artery above the point of dilation. For more than a century his experiments on canine legs have borne fruit an hundredfold in saving human lives and limbs.

Hunter first learned by experiments on pigeons and young pigs "that the growth of bone takes place mainly from the exterior and is probably produced by the nutritive power of the periosteum." Subsequently this question was further examined experimentally by Howship,[26] Flourens,[27] Heine,[28] Murray, and others.

Mr. Syme[29] endeavored to ascertain "whether the periosteum possesses the power of forming new osseous substance independently of any assistance from the bone itself. He extirpated the middle portion of the radius of a dog with its periosteum and found, as Sir Astley Cooper had previously done, that after the recovery of the animal there was no bony union, but a ligimental band running from one extremity to the other."

Leopold Ollier,[30] by transplanting portions of the periosteum, demonstrated the power of the membrane to produce new bone and showed that in the resection of bone, if the periosteum is left, new bone will be developed in from one to three months. Following the teachings of his animal experiments, he introduced the operation of resection for diseased bone, one of the most important discoveries in surgery, which inaugurates a new era in surgical procedure. The practical results of his discovery are to-day fully approved by surgeons in the management of injuries or disease of the bones and joints.

As we witness some capital operation performed at the present day without pain, almost bloodless, followed neither by fever nor suppuration, we may ask how far these great results are due to experiments on animals. The anæsthesia of chloro-

form was discovered through experimentation on a low form of animal life, the ant. The illustrious Simpson practiced and perfected his use of chloroform on animals before he anæstheticized his first patient. While its discovery as an anæsthetic can not be claimed as altogether due to experiments on animals, its great uses in surgery would be incomplete but for such experiments. The same is true of that other great alleviator of pain, the hypodermic, which was first used by Mr. Rand[31] on his sporting dogs. He says: "I feared that hypodermic injections might excite suppurative inflammations in the subcutaneous tissue, but when I found from experiments on dogs that this was not the case, I gained confidence that justified their use on man."

Whether Ambrose Pare made experiments on animals before using the ligature on man is not clear, but all the steps which were necessary to perfect this discovery, and all the other means for arresting hemorrhage from bleeding vessels, have been the results of experiments on animals by Hunter,[32] Jones,[33] Benjamin Travers,[34] Bryant,[35] and a long list of eminent surgeons during the past century.

Robert McDonnell states that great as are these triumphal epochs in surgery which have rendered operations painless and bloodless, the practical surgeon of to-day values even more highly those antiseptics which render convalescence after operation free from fever and suppuration.

These three great epochs alone are sufficient to exalt animal experimentation to the first place as a means of scientific advancement, nor can they be obscured by the multitude of brilliant discoveries that are showering upon us with a bewildering rapidity in these latter days.

I can not help again calling your attention to the peculiar significance of the fact that etiology, which by right should have come first in the study of disease, has hitherto marched but haltingly in the rear, because it must depend upon animal experimentation alone for its development. It is unfortunate that a false sentiment has sought by every possible means to retard and check the progress of those who essayed this path of investigation.

The first step in this important field of research was taken in 1850, when a commission of the medical association of the "Eure et Loir" proved that splenic fever could be communicated from one animal to another by inoculation; and the first hint of bacteriological study was given when Davaine[36] and Rayer found constantly in the blood of animals so inoculated little thread-like bodies.

At about the same time Professor Virchow[37] furnished definite knowledge of the inception and prevention of parasitic diseases by a series of experiments on animals to determine the origin, nature, mode of development, and communicability of trichinosis. Through these investigations the medical profession first became aware of the existence of a fatal and heretofore unknown disease, and were at the same time made acquainted with its source and manner of production.

M. Villemin[38] inaugurated a new and important era in medicine when he established the fact that tuberculosis is an infectious disease. By laboratory experiments he found that general and fatal tubercular infection is produced in animals when they are inoculated with crude tubercular matter from the human subject. His experiments in this line were soon confirmed by other investigators, and led directly to all the far-reaching results, determining the modes by which tubercular infection can be propagated. Villemin's discovery revealed endless possibilities and was followed by similar investigations of many infectious diseases.

The invaluable studies of Pasteur[39] introduced us into "a new world of strange knowledge." His insight into the doctrine of fermentation carried him far beyond the agencies of microscopic organisms in fermentative processes. He not only isolated and obtained pure cultures of these organisms, but also studied their life history, and, by methods which had served him in all his previous investigations, placed bacteriological science on a firm basis. He demonstrated that if the cause of an infectious disease be a self-multiplying germ from the outside world, the habits of the living enemy can be studied in its outside relations, and that definite knowledge may thus be obtained as to its biological affinities. No work has ever promised greater things to the world than does that of Pasteur.

The knowledge obtained by observation, previous to the middle of the present century, concerning the changes effected by disease now began to be examined from a new point of view. Pasteur's methods of experimentation were adopted and practiced by investigators all over the world, and his doctrine that the cause of infectious diseases was to be sought in self-multiplying germs was everywhere accepted.

The crowning glory of Pasteur's work came with the discovery of attenuation of bacterial toxic products, the possible results of which defy the imagination. In the record of human industry there is no work of richer or grander promise. Yet it is a work which, from the very nature of the case, was possible only by experiments on living animals.

The endless possibilities of research which the new doctrine of infection suggests to the mind of the pathologist was the beginning of the most brilliant era in the

science of medicine since it has existed. It would not be possible in the time allotted to me even to refer to all the investigations which have been made along the line so clearly defined by Pasteur.

I must pass by even the list of diseases over which victory has been made possible, in order that I may speak briefly of those in which practical results are already attained or in sight. The time is here when abstract scientific principles are bearing concrete fruit in the prevention and cure of disease.

The application of Pasteur's doctrine by Mr. Lister to the antiseptic treatment of wounds, an application which was enforced by Mr. Lister's eminent skill as an experimenter, has been a full confirmation of this principle. The germs which Pasteur imprisoned in his test tubes were liberated by Lister's genius. Together they have put to flight the horrors of surgery, and forever stand guard when the surgeon plunges his knife into the sleeping flesh or binds up the torn and mangled body.

The discovery of the bacillus tuberculosis by Koch[40] marks another brilliant effort in medical science. The details of the work by which he reached this great discovery are too familiar to be repeated here, but it was only accomplished by Pasteur's method of continuous animal experimentation. It has not merely revolutionized our knowledge of tuberculosis, but has enabled us to understand and explain the morbid processes of tubercular disease. The stimulus which Koch's work gave to investigation in all countries is bearing fruit in the departments of preventive medicine and therapeutics. The light which flashed from his laboratory was the dawn of hope that is already breaking into the day of certainty, when we shall hold a prevention and cure of tuberculosis in our grasp.

Following the line of Pasteur's work on the attenuation of bacterial toxic products, Kitasato[41] and Behring[42] in their experiments on the immunity and cure of tetanus have given definite knowledge of the prevention and cure of infectious diseases, which goes far toward the realization of the hope inspired by the work of Koch on the toxic products of the bacillus tuberculosis.

Within the past two decades animal experimentation has accomplished more in the field of cerebral location than all the preceding centuries of carefully recorded cerebral symptoms studied in the light of post mortem observations. It has opened to surgeons an entirely new field of operations. Until the middle of the present century the brain was described as a single organ, and physiologists attributed to its functions no special localization. To-day the areas of motion and of special sense and to a limited extent the mental areas also, have been definitely placed. Most, if not all, of this knowledge has been derived from experiments on the brains of living animals. From the time when Fritsch and Hitzig[43] reported their faithfully recorded and startling experiments in this new field of research, giving such complete details of their experimental procedure that other investigators could easily follow and test their accuracy, numerous workers have been adding to our knowledge, until we now have definite and safe rules by which we may localize many cerebral lesions. Any discrepancies which have been claimed as invalidating this line of work, Dr. Ferrier[44] states will be found on careful examination to be more apparent than real, and that experiments on animals under conditions selected and buried at the will of the experimenter are alone capable of furnishing precise data for sound inductions as to the functions of the brain in its various parts.

The surgeons have not not been slow to make this knowledge practical in skillfully devised operations. The region beyond the skull is no longer forbidden ground. The hopeless, because powerless, inactivity that once watched in wondering silence the meaningless signs of conflict within the mind's temple, has now given place to a keen activity that boldly enters the inner court to seize the offender even at the base of the altar.

As we review the history of the experimental work which has placed medicine in the list of the sciences we are impressed with the fact that while each line of research was carried on for its own results, nevertheless most of the discoveries remained apparently barren until subsequent discoveries invested them with an unexpected importance.

The fatal error of critics of experimental work is their demand that every experiment shall bear fruit immediately. Few if any of them seem to be familiar with scientific methods. They constantly wander from the real issues to the moral or morbidly sentimental aspect of the question.

It seems evident from the history that I have spread before you in this brief and fragmentary manner, that most, if not all, of the real advances in medicine have been made possible through experimentation. The only point open to discussion, then, from either moral or ethical point of view, is, what price should be paid by the world for the benefit received. This review of what our profession has thus far done to serve mankind in this field is not a plea for mercy—not a bribe to tempt a captious public. My voice has proved a recreant servant if any tones of doubt or fear have marred this exposition. Its every part is cause for pride. In such a sketch,

however cursory it may be, each point reflects the light of noble purpose and overflows with promise of better things to come. So long as the moral and spiritual development of mankind remains the supreme purpose of creation, medical science can claim equal honors with the science of God, and in the conflict with physical evil must be the first to meet the foe. Until Infinity repeals the edict which gave man power over all created things, the right to claim the service of the brute creation, although it takes the life of the animal or tears it limb from limb, can never be denied to him who devotes his life to the service of mankind.

In this defense of animal experimentation results have not been made prominent with any purpose to conceal methods. We are fully prepared to count the cost and to meet the question, Does the end justify the means? As devotees to medical science, we yield precedence to none in honesty and lawfulness of purpose, or faithfulness of service in the bitter conflict humanity ever has waged and ever must wage against pain and disease. We, too, have hearts that love and pity, that ache, and sometimes even break beneath the loads they bear. We glory in our experimental work because we know the tenderness of cruelty, the balm of pain, the life whose birth is only in the throes of death. Must, then, our conflict cease? Our weapons be laid aside because selfish ambition has now and then made fiends of men? Since philosophers first learned to trace "with their golden pen on the deathless page" heroic deeds of men, humanity has never failed to offer its first homage to those who gave their lives for others. As the servants of such a science we can fearlessly appeal to all intelligent men for a just criticism. From the ignorant we expect to receive only censure, but from those who in "the valley of the shadow of death" have learned to know what manner of men we are, I have faith to believe the reply will come: We have trusted you with the lives of our loved ones; we intrust to you God's dumb creation.

NOTES.

[1] Aristotle.*a* History of Animals. Aubert and Wimmer's edition.

Book II, Chapter II, section 44, vol. i, p. 272. (In the Chameleon) "When cut open respiration continues active for a long time, and there occur very slight movements in the heart; and contractions take place not only and especially in the region of the ribs, but also in the other parts of the body."

Book III, Chapter XIX, section 90: "In no animal has the blood any feeling when touched, any more than the excretions in the belly; nor has the brain or marrow,*b* when touched, any feeling.

[2] On Practical Anatomy and Experimental Physiology. De Anatomicis Administrationibus. Galeni Opera Omnia, Kuhn's edition, vol. ii, pp. 651–706.

An in Arteriis Natura Sanguis Contineatur. Galeni Opera Omnia, Kuhn's edition, vol. iv, p. 703. Is blood naturally contained in the arteries?

"For we have often exposed the large arteries convenient for this purpose, and asked the disciples of Erasistratus whether the artery thus exposed did not seem to contain blood. They were obliged to confess that it did, both because Erasistratus asserted that the blood passed into the arteries when they were uncovered, and because the fact was evident to the senses; for having placed ligatures on both ends of the inclosed portion of the artery, and made an incision into the vessel between them, I showed that the artery itself was full of blood."

Book VIII, Chapter II: "There is a form of respiration which is considered to be a natural (i. e., involuntary) as opposed to a psychical (i. e., voluntary) function, and in which the lower parts of the chest and hypochondria are seen to be plainly in motion, but the upper parts sometimes not at all and sometimes obscurely. This is accomplished by the diaphragm alone, which is a muscle not only in structure but in function also."

"But our teachers were wrong in believing the diaphragm to be the sole mover of the chest in respiration, expanding it when itself in contraction, and when itself in relaxation permitting the chest to collapse, for they did not explain how we are able to blow out vigorously or to vocalize. They thought that when the ample movements of the chest, which we see in running and in all such sharp gymnastics, are accomplished by the energy of the diaphragm." Galen goes on to say that no account was taken of the intercostals or muscles of forced breathing.

Book VIII, Chapter III: The technique of the dissection and experimental physiology of the muscles of respiration is here given, and the anatomy of the two sets of intercostals is described. The experiments are done on pigs because their voices are so strong that effects can be well observed.

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a The extract from Aristotle, Galen, Vesalius, Columbus, and Malpighi were kindly furnished by Prof. J. G. Curtis from his library.

b The word marrow, *μυελός*, is used by Aristotle indifferently for the marrow of the bones and the spinal cord, the functions of which latter were unknown to him.

In the external intercostal muscles are divided first and then the internal, the voice and forced breathing are abolished.

Galen uses large pigs so that opening the pleura may be avoided, and advises one to practice well on the cadaver before experimenting. This demonstration of the use of the intercostal muscles Galen claims as new and original with him.

Book VIII, Chapter IV: Next he proves that the intercostal muscles owe their power to the intercostal nerves. For this purpose all these nerves are exposed near the spine and ligatured, but not so tightly as to bruise or sever the nerves. The ligatures on the nerves if moderately tight (1) paralyze the intercostal muscles, (2) prevent forced breathing, (3) abolish the voice. All these functions return when the ligatures are removed.

Book VIII, Chapter V: If the nerves now called the vagi are destroyed a hoarse sound like a snore may still be produced; but if the intercostal muscles are paralyzed there is no hoarse sound at all.

Paralysis of the intercostal muscles may be effected not only by (1) section of their fibers, and (2) injury of their nerves, but by (3) excision of their ribs, and by (4) section of the spinal cord at the beginning of the back, between the seventh cervical and first dorsal vertebræ. This section of the spinal cord is found to paralyze every muscle below except the diaphragm, and also to render the animal voiceless. In an animal breathing only by the diaphragm, after section of the spinal cord at the beginning of the back, section of the phrenic nerves is seen to be followed by the contraction of certain accessory muscles at the upper part of the chest. In another animal Galen cut the phrenic nerves in the neck, and found that while the diaphragm was paralyzed, the intercostal muscles continued to act. In experiments where the spinal cord was cut at the beginning of the back, the upper and lower parts of the thorax might be seen to move—the lower by means of the diaphragm, the upper by means of accessory muscles.

In Book VIII, Chapter VI, the technique of cutting the spinal cord is given minutely. Galen sometimes used sucking pigs for this purpose. "When the spinal cord is divided longitudinally from above downward, directly in the middle line, not one of the intercostal nerves is paralyzed, either to the right or left, nor the lumbar nor crural nerves. But if the cord is divided transversely only one-half way, on either the right or left side, all the nerves of the injured side are immediately paralyzed." Hemisection of the cord reduces the volume of the voice one half; complete section produces complete aphonia.

Book VIII, Chapter VII: Excision of the ribs destroys forced breathing and the voice as much as section of muscles or of nerves. Galen describes the technique of this excision. It must be subperiosteal, and he cautions against piercing the pleura. The impression received is that not all of the ribs are to be removed.

Book VIII, Chapter IX: Section of the spinal cord at its commencement, or below the first, second, or third cervical vertebræ totally paralyzes respiration and the whole of the body below; if below the sixth vertebræ the animal can still use the diaphragm, and if cut farther down other muscles of respiration remain intact. The lower the section the greater the number.

[3] Andreæ Vesalii, Bruxellensis, 1543. De Humani Corporis Fabrica. Lib. Septem, De Vivorum Sectione:

"In order that the life of an animal may be restored, an opening should be made in the trunk of the aspera arteria (trachea), into which a canula of reed is inserted and this blown through; for on slight inflation in the living animal the lung swells up to the size of the thoracic cavity, and the animal breathes after a fashion. The heart then resumes its force, and its motion varies with beautiful diversity. The lung being inflated from time to time, the motion of the heart can be well examined, both by sight and touch, and the trunk of the great artery (aorta) which extends along the back can be examined also in the thoracic cavity or as far as the lumbar vertebræ.

"Nothing appears more manifest to you than the rhythmic beat of the heart and arteries, which, being observed for a time, the lung should be inflated again. By this artifice, than which nothing I have discovered in experimental physiology (literally anatomy, but with more than its present meaning) pleases me more, much knowledge of the changes in the pulse may be obtained; for when the lung has remained flaccid for a time the pulse or motion of the heart and arteries is seen to be undulating, creeping, or vermicular, but, the lung being inflated, the pulse becomes large and rapid and shows remarkable inequality.

"I may say that this is the experiment by which I demonstrate to the best advantage to the candidates in medicine the nature of every kind of pulse."

[4] Realdi Columbi, De Re Anatomica. Venetiis, MDLIX, page 177, l. 10–20.

"There are two cavities in the heart; that is, two ventricles, not three, as it seemed to Aristotle. One of these is to the right, the other to the left; the right is much larger than the left and contains natural blood, while the left contains the vital. Moreover, it is easy to satisfy oneself by observation that the substance of the

heart which incloses the right ventricle is thin, and that the left is thick; this is partly for the sake of equilibrium, and partly in order that the vital blood, which is very thin, may not exude. For between these ventricles there is a septum through which almost all think that a passage is open for the blood from the right ventricle to the left, and that the easier, because on the way the blood is attenuated for the purpose of the generation of the vital spirits. But they are much out of the way; for the blood is carried through the pulmonary artery to the lung, and there undergoes its attenuation; thence, along with air, it is carried through the pulmonary vein to the left ventricle of the heart; which fact no one has hitherto noticed, or left recorded, although it is most worthy of the attention of all."

Page 178, l. 31–38: "Indeed, I think just the opposite, namely: That the pulmonary vein is to carry blood, mixed in the lungs with air, to the left ventricle of the heart; which is as true as truth itself; for if you will examine not only in the cadaver but likewise in the living animal, you will find always this (vein) filled with blood, which would by no means be the case if it were merely for air and vapors."

Page 224, l. 16–21: "Verily, I beseech you, oh, candid reader, studious of the learned, but most studious of the truth, to experiment upon animals and to dissect them alive. Try, I say, whether what I have said agrees with the facts; for in these animals you will find the pulmonary vein full of blood, not filled with air or smoky fumes, as they call them, please God! Only the pulse is lacking."

[5]Harvey's works. Sydenham edition, page 19:

"When I first gave my mind to vivisections as a means of discovering the motions and uses of the heart, and sought to discover these from actual inspection, and not from the writings of others, I found the task so truly arduous, so full of difficulties, that I was almost tempted to think, with Fracastorious, that the motion of the heart was only to be comprehended by God. For I could neither rightly perceive at first when the systole and when the diastole took place, nor when nor where dilation and contraction occurred, by reason of the rapidity of the motion, which in many animals is accomplished in the twinkling of an eye, coming and going like a flash of lightning, so that the systole presented itself to me now from this point, now from that; the diastole the same; and then everything was reversed, the motions occurring, as it seemed, variously and confusedly together. My mind was therefore greatly unsettled, nor did I know what I should myself conclude, nor what believe from others; and I was not surprised that Andreas Laurentius should have said that the motion of the heart was as perplexing as the flux and reflux of Euripus had appeared to Aristotle. At length, and by using greater and daily diligence, and collating numerous observations, I thought that I had attained the truth, that I should extricate myself and escape from this labyrinth, and that I had discovered what I so much desired, both the motion and use of the heart and the arteries. Since which time I have not hesitated to expose my views upon this subject, not only in private to my friends, but also in public, in my anatomical lectures, after the manner of the academy of old."

From a biographical sketch of Harvey in the Philosophical Transactions, London, Abridgement, 1809, page 319:

"He shows, by experiments made on living animals, that the motion of the heart is performed by the contraction of its muscular fibers; that the auricles contract first, and thereby propel the blood into the ventricles; then the ventricles contract, whereby the blood is driven into the arteries; being prevented from returning into the auricles by the situation and connection of the valves. Now, as by repeated contraction of the ventricles more blood is constantly propelled into the arteries than can be supplied by nourishment thrown into the veins (as appears upon calculation), and, as moreover, the arteries can not receive blood through any other channel but the veins, it follows either that the veins must be quickly emptied, and the arteries, on the contrary, every moment more and more distended; which, however, is not the case; or that the blood must flow back again from the arteries into the veins by certain secret passages, or by pores of the flesh, or by mutual anastomoses of the arteries and veins. He demonstrated that the last-mentioned communication takes place in the lungs. Again, as along the course of the arteries more blood is sent from the heart to all parts of the body than is necessary for the nourishment of those parts, he infers that the superflous blood is returned by the veins (that they may not be left empty) from the fact that no blood is found in the veins if the great artery be tied. On the other hand, if a ligature be placed on the vena cava at the place where it joins the right auricle, it will immediately become distended in a very surprising manner. Moreover, it must be evident to every one (he observes) who considers the situation and connection of the valves, that the blood passes from the smaller branches of the veins into their trunks, and from thence to the heart."

[6]M. Malpighi. Opera Omnia. Lugduni Batavarum. Apud Petrum Vander Aa. Bibliopolam MDCLXXXVII, Vol. II. De Pulmnibus Epistola II, page 328:

"These things being apparent as regards the mere structure and connection [of the lungs], microscopic observation discovered still more wonderful things. For if the heart is still pulsating the contrary motion of the blood is to be observed in the vessels, although with difficulty, so that the circulation of the blood is plainly to be detected, and can be made out even more successfully in the mesentery and in the other large veins contained in the abdomen. The blood then [entering] an [air] cell by the impulse through the arteries, as one or another conspicuous branch passes by or ends in a cell, rains down, finely broken up, as though poured out, and thus multitudinously divided loses its ruddy color, and, carried sinuously about, is scattered on all sides until it lands at the walls and angles [of the air cells] and the branches of the veins, which take it up again.

"Nothing more could be seen in the living animal operated upon; hence, I had believed that the body of the blood broke out into an empty space and was gathered together again by an open-mouthed vessel and by the help of the structure of the walls [of the air cells]. · The basis for this view was offered by the tortuous movement of the blood, diffused as it was in various directions, and by the gathering of it together at a definite point; nevertheless, my faith was shaken by the [appearance of the] dried lung of a frog, which, as it happened, had retained the redness of the blood in its smallest parts (vessels as I found them afterwards); for by the aid of a more perfect glass there appeared to the eye no longer points which looked like the skin called shagreen, but in place of them minute vessels mingled together ring-fashion; and so great is the divarication of these vessels, as they spring here from vein and there from artery, that there is no longer any order preserved, but they appear as a network made up of the prolongations of the two [main] vessels. This network not only occupies the entire area [of the air cell], but extends to the walls and blends with the efferent vessel, as I was able to observe repeatedly, although with great difficulty, in the oblong lung of the tortoise, which is likewise membranous and diaphanous. Hence, it was made apparent to the senses that the blood was divided up and flowed through tortuous vessels, and was not poured out into spaces, but moved always through little tubes, and was scattered owing to the multitudinous bends of the vessel. Nor is it any new thing in nature for the terminal mouths of vessels to be joined together, since in the intestines or other parts the same plan is followed; and, even more wonderful though it may seem, the upper ends of veins are joined with the lower ends [of others] by anastomosis, as was very well observed by the most learned Fallopius.

"In order, however, to obtain and verify the foregoing results, tie the turged lung with a string, at its junction with the heart, as it protrudes from an open frog and while it is everywhere abundantly flushed with blood; for such a lung when dried will continue to have its vessels swollen with blood, which then you will see exceedingly well by examining them against a horizontal sun with a microscope of a single lens. Or you may use another method in looking at the vessels. Place the lung upon a plate of crystal illuminated by the light of a lantern from beneath through a tube; employ for this a microscope of two lenses, and there will be visible to you vessels arranged in rings, and by means of the same disposition of instruments and light you will observe the movement of the blood through the said vessels, and, by varying the amount of light, you will be able to contrive for yourself other things which defy description by the pen."

[7 and 8] Account of some discoveries made by Mr. Galvani, of Bologna, with experiments and observations on them. In two letters from Mr. Alexander Volta, F. R. S., professor of natural philosophy in the University of Pavia, to Mr. Tiberius Cavello, F. R. S. Read January 31, 1793. (Philosophical Transactions, London, 1793, pp. 10–44.)

The fact that these letters are written in old and very bad French renders a certain freedom of translation necessary.

In speaking of the Commentary of Galvani, entitled "Aloysii Bononiæ Galvani de Viribus Electricitatis in Motu Musclari Commentarius, 1791, 4to; de 58 pages, avec quatere grandes planches," Volta says: "It contains one of the most beautiful and surprising discoveries, and the germ of many others.

(1) "Dr. Galvani, having dissected and prepared a frog in such a manner that the legs were attached to the spinal cord only by the exposed crural nerves, and having cut off the rest of the body, saw that he excited lively movements in the legs, with spasmodic contraction of all the muscles, each time that a spark was drawn from the conductor, not only on the body of the animal but upon every other body and in every direction (the legs being at a considerable distance from the large conductor of the electrical machine, and under certain other circumstances which I shall explain further on).

"The required circumstances were, therefore, that the animal thus dissected should be in contact or very near some sort of metal or other good conductor, sufficiently

extended, and better yet, between two similar conductors, one of which should be turned to the extremity of said legs or some one of their muscles, the other toward the spine or the nerves. It was also very advantageous that one of these conductors (which the author distinguished by the names of "nerve conductor" and "muscle conductor"), and preferably the latter, be in free communication with the floor. It is in this position, especially, that the legs of the frog, prepared as has been described, received violent shocks, and twitched and struggled with vivacity at each spark of the conductor from the machine, although it was quite far distant, and although the discharge was made neither on the nerve conductor nor on the muscle conductor, but on any other equally distant from them, having all communication for the transmission of such a discharge, for example, on a person placed in the opposite corner of the room."

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(5) "I applied myself with considerable attention to determine what was the least electric force necessary to produce these results in the frog intact and full of life, as well as one dissected and prepared in the manner described, which Mr. Galvani had omitted to do. I chose the frog in preference to any other animal, because it is endowed with great vitality and is easily prepared. Moreover, I have made experiments upon other small animals, with the same end in view and with about an equal success. To properly estimate the value of the electric force, I thought it proper to subject the animal, destined for experiments of this kind, not to the return currents occasioned by the atmosphere, but to the direct electrical discharges, now by a simple conductor, now by a Leyden jar, in such a manner that all the current should go through the body of the animal. To this effect I was careful to hold it isolated in some manner or other, and more often by fastening it with pins to two plates of soft wood, supported by glass columns."

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(8) "Thus we have, in the legs of the frog attached to the spinal column solely by the uncovered nerves, a new kind of electrometer, since electric discharges which give no indications with the ordinary machines give marked signs with such an animal electrometer."

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(11) "Mr. Galvani did not stop here in these truly astonishing experiments on the frog. He extended them with success not only to other cold-blooded animals but to birds, in which he obtained the same results by means of the same preparations, which consisted in disengaging one of the principal nerves from its envelope, where it entered a member susceptible of movement, arming such a nerve with a piece of metal and establishing a communication by means of a conducting arc of the nerve and its muscles" (with the machine).

(12) "He also very happily discovered, and demonstrated in a very evident manner, the existence of an animal electricity in all or nearly all animals."

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(19) "Experiment A. I caught with forceps the ischiatic nerve a little below its insertion in the thigh and applied wires, a piece of money, or other metallic plate; a little higher up upon the same nerve, carefully dissected from its attachments and held up by a thread, or supported by a plate of glass, a stick of beeswax, or of dry wood, or any other poor conductor. Then applying the body of a Leyden jar very feebly charged to said forceps, I carried the arc into contact with the other metallic plate and saw that the discharge was made, which, though not strong enough to give the least spark, caused all the muscles of the thigh and leg to become convulsed and twitch more or less impetuously. This was true of the nerve throughout the entire leg, or any part of the nerve projecting beyond it, when in the course pursued by the current in its transit, though but a small portion of the nerve be irritated, this, nevertheless, was sufficient to occasion contraction of the muscles."

[9]An Account of an Experiment, made by Mr. Hook, of preserving Animals alive by blowing into their Lungs with Bellows. Philosophical Transactions, London, No. 28, page 539:

"I did, therefore, heretofore give this illustrious society an account of an experiment I formerly tried of keeping a dog alive after his thorax was all displayed by the cutting away of the ribs and diaphragm, and after the pericardium of the heart was also taken off; but divers persons seeming to doubt of the certainty of the experiment (by reason that some trials of this matter made by some other hands failed of success), I caused at the last meeting the same experiment to be shown in the presence of this noble company, and that with the same success as it had been made by me at first, the dog being kept alive by the reciprocal blowing up of his lungs with bellows, and then suffered to subside, for the space of an hour or more after his thorax had been displayed and his aspera arteria (trachea) cut off just below the epiglottis and bound upon the nose of the bellows."

[10] The Croonian Lecture on some Physiological Researches, respecting the Influence of the Brain on the Action of the Heart and on the Generation of Animal Heat. By Mr. B. C. Brodie, F. R. S. Read December 20, 1810. Philosophical Transactions, London, 1811, Volume XI, page 36:

"In making experiments on animals to ascertain how far the influence of the brain is necessary to the action of the heart, I found that when an animal was pithed by dividing the spinal marrow in the upper part of the neck respiration was immediately destroyed, but the heart still continued to contract circulating dark-colored blood, and that in some instances from ten to fifteen minutes elapsed before its action had entirely ceased. I further found that when the head was removed the divided blood vessels being secured by a ligature, the circulation still continued, apparently unaffected by the entire absence of the brain. These experiments confirmed the observations of Mr. Cruikshank (Phil. Trans., 1795) and M. Bichat (Recherches Physiologiques sur la Vie et la Mort) that the brain is not directly necessary to the heart, and that when the functions of the brain are destroyed the circulation ceases only in consequence of the suspension of the respiration. This led me to conclude that if respiration were produced artificially the heart would continue to contract for a still longer period of time after the removal of the brain. The truth of this conclusion was ascertained by the following experiment:

"*Experiment 8.*—I divided the spinal marrow of a rabbit in the space between the occiput and the atlas, and having made an opening into the trachea, fitted into it a tube of elastic gum, to which was connected a small pair of bellows, so constructed that the lungs might be inflated and then allowed to empty themselves. By repeating this process once in five seconds, the lungs being each time fully inflated with fresh atmospheric air, an artificial respiration was kept up. I then secured the blood vessels in the neck, and removed the head by cutting through the soft parts above the ligature and separating the occiput from the atlas. The heart continued to contract, apparently with as much strength and frequency as in the living animal. I examined the blood in the different sets of vessels and found it dark colored in the venæ cavæ and pulmonary artery and of the usual florid red color in the pulmonary veins and aorta. At the end of twenty-five minutes from the time of the spinal marrow being divided the action of the heart became fainter, and the experiment was put an end to."

[11] New Pneumatic Experiments about Respiration, by the Hon. Robert Boyle. (Phil. Trans. Lond., No. 62., p. 2011.)

The account of these experiments is so long that it will be impossible to reproduce it here. The headings, or "titles," of the different chapters will give a sufficient insight into the experiments themselves. The air pump, then newly invented, was employed in nearly all of them:

The first title: Observations on the lasting of Ducks included in the Exhausted Receiver.

The second title: Of the Phænomena afforded by Vipers in an Exhausted Receiver.

The third title: Of the Phænomena afforded by Frogs in an Exhausted Receiver.

The fourth title: Of the Phænomena afforded by a newly kittened Kitling in the Exhausted Receiver.

The fifth title: Some Trials about Air usually harbored and concealed in the Pores of the Water, etc.

The sixth title: Of the Phænomena afforded by Shell Fishes in an Exhausted Receiver.

The seventh title: Of the Phænomena of a Scale Fish in an Exhausted Receiver.

The eighth title: Of two Animals with large Wounds in the Abdomen, included in the Pneumatic Receiver.

The ninth title: Of the Motion of a Separated Heart of a Cold Animal in the Exhausted Receiver.

The tenth title: A Comparison of the Times wherein Animals may be Killed by Drowning or Withdrawing of the Air.

The eleventh title: Of Accidents that Happened to Animals in Air Brought to a Considerable Degree, but not near the utmost of Rarefaction.

A Digressive Experiment Concerning Respiration upon very high Mountains.

The twelfth title: Of the Observations produced in an Animal in Changes as to Rarity and Density made in the selfsame Air.

The thirteenth title: Of an Unsuccessful Attempt to prevent the Necessity of Respiration by the Production or Growth of Animals in our Vacuum.

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The fifteenth title: Some Experiments showing that Air, become unfit for Respiration, may retain its wonted Pressure.

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The seventeenth title: Of the Long Continuance of a Slowworm and a Leech alive in the Vacuum made by our Engine.

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The eighteenth title: Of what happened to some Creeping Insects in our Vacuum.

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The nineteenth title: Of Phænomena suggested by Winged Insects in our Vacuum.

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The twentieth title: Of the Necessity of Air to the Motion of such small Creatures as Ants, and even Mites themselves.

[12] Joseph Priestly's Experiments on Respiration. Philosophical Transactions, London, Vol. LXII, p. 147. Read March 5, 12, 19, 26, 1772.

His first experiments were upon "fixed air" (carbon dioxide), and for the purpose he used "insects and animals which breathe very little," and frogs.

He then tried different methods for restoring air, in which candles had been burned, to its former state, such as the effects of heat, cold, and condensation. Page 166:

"Though this experiment failed, I flatter myself that I have accidentally hit upon a method of restoring air which has been injured by the burning of candles, and that I have discovered at least one of the restoratives which nature employs for this purpose. It is vegetation.

"On the 17th of August, 1771, I put a sprig of mint into a quantity of air in which a wax candle had been burned out, and found that on the 27th of the same month another candle burned perfectly well in it.

"This restoration of air I found depended upon the vegetating state of the plant, for though I kept a great number of the fresh leaves of mint in a small quantity of air in which a candle had been burned out, and changed them frequently, for a long space of time, I could perceive no melioration in the state of the air."

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Page 181: "That candles will burn only a certain time is a fact not better known than it is that animals can live only a certain time in a given quantity of air, but the cause of death of the animal is not better known than that of the extinction of flame in the same circumstances."

Priestly noticed that plants put into air tainted by putrefaction grew vigorously, and at page 193 he says: "This observation led me to conclude that plants, instead of affecting the air in the same manner with animal respiration, reverse the effect of breathing, and tend to keep the atmosphere sweet and wholesome when it is become noxious in consequence of animals living and breathing or dying and putrefying in it."

He fully proved his conclusions by experiments upon mice, and the experiments will be found in detail in the article from which I have quoted.

[13] Traité Élémentaire de Chimie par Lavoisier. 3d ed., 1801, t. ii, p. 173. Expériences sur la Respiration des Animaux, et sur les Changemens qui arrivent à l'air en passant par leur poumon.

"I confined in a convenient apparatus, of which it will be difficult to give an idea without recourse to figures, 50 cubic inches of common air. I introduced into this apparatus 4 ounces of very pure mercury, and proceeded to the calcination of it by keeping up for twelve days a degree of heat almost equal to that which it is necessary to make it boil.

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I observed that the air which the vessel contained was diminished by 8 or 9 cubic inches.

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This air thus diminished would not precipitate lime water, but it extinguished flames, and caused animals placed in it to perish in a little while.

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In the preceding experiment the mercury in calcining had absorbed the better part—the respirable part—of the air, and had left the mephitic or nonrespirable."

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By reduction he "reestablished the air to almost exactly the state it had before calcination—that is to say, the state of common air. This air, thus reestablished, no longer extinguished flame, no longer killed animals which breathed it.

"Here, then, is an example of the very complete proof at which one can arrive by means of chemistry, the decomposition of the air and its recomposition. It evidently results:

First. That five-sixths of the air which we breathe, is, as I have already announced in a preceding memoir, in a mephitic state—that is to say, incapable of maintaining the respiration of animals and the combustion of bodies.

Second. That the surplus—that is to say, one-sixth only of the volume of atmospheric air, is respirable.

Third. That in the calcination of mercury this metallic substance absorbs the healthful part of the air, leaving only the mephitic.

Fourth. That in bringing these two parts of the air thus separated together, the respirable part and the mephitic part, one makes again air like that of the atmosphere."

[14] An account of the method of conveying liquors immediately into the mass of the blood. By Mr. Oldenburg. Philosophical Transactions, London, No. 7, p. 128. (Abridgment, Vol. I, p. 45.)

"In this account it is asserted that the discovery of a method of conveying liquor immediately into the mass of the blood is due to Dr. Christopher Wren, at that time Savillian professor in the University of Oxford. The method which he followed was to make a ligature on the veins, and having made an opening into them on the side of the ligature toward the heart, to introduce into them slender syringes or quills fastened to bladders (in the manner of clyster pipes) containing the matter to be injected; performing the operation upon pretty big and lean dogs, that the vessels might be large enough and easily accessible. These experiments were made at different times upon several dogs. Opium and the infusion of crocus metallorum were injected into the veins of the hind legs of these animals. The opium soon stupified though did not kill the dog; but a large dose of crocus metallorum induced vomiting and death in another dog. These experiments are more circumstantially related by Mr. Boyle in his excellent book on Usefulness of Experimental Philosophy, Part II, Essay II, pages 53–55."

A letter from Dr. Timothy Clark. (Phil. Trans., Lond., No. 35, p. 672.)

Dr. Clark here gives the time of the infusing of liquors into the blood by Dr. Christopher Wren, showing that it was done in the house of the French ambassador, Duc de Bordeaux, in the year 1657.

[15] [16] In a letter from Dr. Timothy Clark, in the Philosophical Transactions, No. 35, page 672, it is stated that Dr. Richard Lower was the first who performed transfusions on brutes, and that the French anatomist, Dr. Denis, was the first who tried it on man; that the account of Dr. Lower's experiment was published in the Philosophical Transactions for December, 1666, but nothing was heard of Dr. Denis's operation until March, 1667.

Richard Lower and Dr. King appear to have been the first who performed the experiment of transfusion of blood. The account will be found in De Corde, item de motu et colore Sanguinis et Chyli in eo transitu, 1669.

[17] "The method observed in transfusing the blood out of one animal into another." By the Hon. Robert Boyle. Phil. Trans. Lond., No. 20, page 353. (Abridgment 1809, Vol. I, p. 128.)

"The method here described was first practiced by D. Lower, of Oxford. Take the carotid artery of the dog or other animal whose blood is to be transfused into another of the same or a different kind, and separate it from the nerve of the eighth pair, and lay it bare above an inch. Then make a strong ligature on the upper part of the artery not to be untied again; but an inch below, viz, toward the heart, make another ligature of a running knot, which may be loosened or fastened as there shall be occasion. Having made these two knots draw two threads under the artery between the two ligatures, and then open the artery and put in a quill, and tie the artery upon the quill very fast by those two threads, and stop the quill with a stick. After this make bare the jugular vein in the other dog about an inch and a half long, and at each end make a ligature with a running knot, and in the space betwixt the two running knots draw under the view two threads as in the other; then make an incision in the vein, and put into it two quills, one into the descendant part of the vein, to receive the blood from the other dog, and carry it to the heart; and the other quill put into the other part of the jugular vein which comes from the head, out of which the second dog's own blood must run into the dishes.

"These two quills being put in and tied fast, stop them with a stick till there be occasion to open them. All things being thus prepared, tie the dogs on their sides toward one another so conveniently that the quills may go into each other (for the dogs' necks can not be brought so near but that you must put two or three several quills more into the first two to convey the blood from one to another). After that unstop the quill that goes down into the first dog's jugular vein, and the other quill coming out of the other dog's artery, and by the help of two or three other quills put into each other, according as there shall be occasion, insert them into one another; then slip the running knots, and immediately the blood runs through the quills as through an artery, very impetuously. And immediately, as the blood runs into the other dog, unstop the other quill coming out of the upper part of the jugular vein (a ligature being first made about his neck, or else his other jugular vein being compressed by one's finger) and let his own blood run out at the same time into dishes (yet not too constantly, but according as you perceive him able to bear it) till the other dog begins to cry and faint and fall into convulsions, and at last dies by his side.

"Then take both quills out of the dog's jugular vein and tie the running knot fast and cut the vein asunder (which you may do without any harm to the dog, one jugular vein being sufficient to convey all the blood from the head and upper parts by reason of a large anastomosis, whereby both jugular veins meet about the larnyx). This done, sew up the skin and dismiss him, and the dog will leap from the table and shake himself and run away as if nothing ailed him."

[18] Sir Charles Bell. Nervous System of the Human Body. Third edition, London, 1844.

Page 24: "It was necessary to know, in the first place, whether the phenomena exhibited on injuring the separate roots of the spinal nerves corresponded with what was suggested by their anatomy. After refraining long, on account of the unpleasant nature of the operation, I at last opened the spinal canal of a rabbit and cut the posterior roots of the nerves of the lower extremity; the creature still crawled, and there were no convulsions of the muscles of the back, but on touching the anterior fasciculus with the point of the knife the muscles of the back were immediately convulsed."

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Page 25: "Every touch of the probe or needle on the threads of this root was attended with a muscular motion as distinct as the motion produced by touching the keys of a harpsichord. These experiments satisfied me that the different roots, and different columns from which those roots arose, were appropriated to different offices, and that the notions derived from anatomy were correct."

Page 26: "On finding this confirmation of the opinion that the anterior column of the spinal marrow and the anterior roots of the spinal nerves were for motion, the inference presented itself that the posterior roots were for sensibility. But here a difficulty arose. An opinion prevailed that ganglions were intended to cut off sensation; and every one of those nerves, which I supposed were the instruments of sensation, have ganglions on their roots.

"Some very decided experiment was necessary to overturn this dogma. I selected two nerves of the encephalon; the fifth which had a ganglion, and the seventh which had no ganglion. On cutting across the nerve of the fifth pair on the face of an ass it was found that the sensibility of the parts to which it was distributed was entirely destroyed. On cutting across the nerve of the seventh pair on the side of the face of an ass the sensibility was not in the slightest degree diminished.

"By pursuing this inquiry I found that the sole organ of sensation in the head and face is a ganglionic nerve. Ganglions were therefore no hindrance to sensation, but on the contrary a necessary accompaniment to a nerve of sensibility; and thus my opinion was confirmed that the ganglionic roots of the spinal nerves were the fasces or faciciculi for sensation."

Page 28: "The nerve of the fifth pair was exposed at its root in an ass the moment the animal was killed, and on irritating the nerve the muscles of the jaw acted and closed with a snap. On dividing the root of the nerve in a living animal the jaw fell relaxed. Thus its functions were no longer a matter of doubt; it was proved to be at once a muscular nerve and a nerve of sensibility. And thus the opinion was confirmed that the fifth nerve is to the head what the spinal nerves are to the other parts of the body, in respect to sensation and volition."

[19] Magendie. Expériences sur les fonctions des racines des nerfs rachidiens. Jour. de Phys., 1822, page 276:

"A second, a third experiment gave me exactly the same result. I commenced to regard it as probable that the posterior roots of the spinal nerves could well have functions different from the anterior roots and that they were more particularly destined for sensibility."

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Page 279: "I have repeated and varied these experiments upon several species of animals. The results which I am about to announce have been confirmed in the most complete manner, be it for the anterior members or for the posterior. I shall pursue these researches and give a more detailed account of them in a future number. It is sufficient for me to be able to announce to-day as positive that the anterior and the posterior roots of the nerves which take origin from the spinal cord have different functions; that the posterior seem more particularly destined for sensibility, while the anterior seem more especially connected with movement."

[20] L'Oeuvre de Claude Bernard. Paris. Bailliere. Leçons de Physiologie; Substances Toxiques.

Système Nerveux. Recurrent sensibility. Vol. I., pages 25–112.

Discovery of function of sympathetic in the neck, pages 317–327.

Page 320: "However, the phenomena following section of the cervical branch of the great sympathetic are not limited only to the pupil. I have found that at the same time there is acceleration of the circulation in all the corresponding half of

the head, the temperature of which rises, the skin becomes more sensitive, and the arterial pulsation is stronger on this side and the vessels are dilated."

For Bernard's work on the action of digitalis, see Action Physiologique de la Digitale et de la Digitaline. (Gourvat, 4°, 74 pp., 1870.)

[21] Brodie, B. C. Experiments and observations on the different modes in which death is produced by certain vegetable poisons. Communicated by the Society for Promoting the Knowledge of Animal Chemistry. Read February 21, 1811. (Philosophical Transactions, London, 1811, Vol. XI, p. 178.)

[22] On the reflex function of the medulla oblongata and medulla spinalis. By Marshall Hall, M. D., F. R. S. L. and E., etc. Read June 20, 1833. (Philosophical Transactions, 1833, p. 644.)

"The first experiment which I made was upon the turtle. The animal was decapitated in the manner usual with cooks, by means of a knife, which divided the second and third vertebræ.

"The head being placed upon the table for observation, it was first remarked that the mouth opened and shut, and that the submaxillary integument descended and ascended, alternately, from time to time, replacing the acts of respiration. I now touched the eye or eyelid with the probe. It was immediately closed. The other eye closed simultaneously. I then touched the nostril with the probe. The mouth was immediately opened widely, and the submaxillary membrane distended. This effect was especially induced on touching the nasal fringes situated just within the anterior part of the maxilla. I passed the probe up the trachea and touched the larynx. This was immediately followed by a forcible convulsive contraction of the muscles annexed to it. Having made and repeated these observations, I gently withdrew the medulla and brain. All the phenomena ceased from that moment. The eye, the nostril, and larynx were stimulated, but no movement followed.

"The next observations were made upon the other parts of the animal. The limbs, the tail, were stimulated by a pointed instrument or a lighted taper. They were immediately moved with rapidity. The sphincter was perfectly circular and closed; it was contracted still more forcibly on the application of the stimulus. The limbs and tail possessed a certain degree of firmness or tone, recoiled on being drawn from their position, and moved with energy on the application of a stimulus. On withdrawing the spinal marrow gently out of its canal, all these phenomena ceased. The limbs were no longer obedient to stimuli, and became perfectly flaccid, having lost all their resilience. The sphincter lost its circular and its contracted state, becoming lax, flaccid, and shapeless. The tail was flaccid and unmoved on the application of stimuli.

"These experiments afford evidence of many important facts in physiology. It proves that the presence of the medulla oblongata and spinalis is necessary to the contractile function of the eyelids, the submaxillary textures, the larynx, the sphincters, the limbs, the tail, on the application of the stimuli to the cutaneous surfaces of mucous membranes. It proves the reflex character of this property of the medulla oblongata and spinalis, and the dependence of these motions upon the reflex function. It proves that the tone of the limbs and the contractile property of the sphincter depend upon the same reflex function of the medulla spinalis—effects not hitherto suspected by physiologists.

"On another occasion, having removed the head of a frog, I divided the spine between the third and fourth vertebra, and separated the upper portion of the animal from the lower. There were then the head, the anterior extremity, and posterior extremity, with their corresponding portions of medulla, as three distinct parts of the animal. Each preserved the reflex function. On touching the eye it was retracted, and the eyelids closed, while similar phenomena were observed simultaneously in the other eye. On removing the medulla these phenomena ceased. On touching the toe of one of the anterior extremities, the limb and the opposite limb equally moved. On removing the spinal marrow this phenomenon ceased, also. Precisely similar efforts were observed in regard to the posterior extremity.

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"One of the most remarkable of the phenomena attached to the reflex function in animals is that presented by those muscles of the hedgehog (Erinaceus Europaeus) by means of which that animal assumes, in certain circumstances, the form and firmness of a ball. The reflex function seems specially to connect the roots of the spine with the muscles. If the animal be examined under the influence of hybernation, the reflex function continues for some hours after the brain has been removed; the panniculus carnosis, the limbs, the tail, the larynx, the sphincter ani, remain excitable, and retain a degree of tone. These phenomena cease on removing the medulla spinalis.

"In the case of the decapitated young hedgehog, after all gasping had ceased, motions of the larynx are still excited on irritating the nostrils, or on irritating the medulla itself; just as the peculiar motions of the trunk are excited on irritating the limbs, tail, or spines, or the spinal marrow.

"Nor are we without evidence that the same principles obtain in the human subject. The condition of the infant born without cerebrum or cerebellum, and breathing from the influence of the medulla oblongata alone, is precisely that of the reflex function, with the addition of respiration. Such a case has been witnessed and described by Lawrence. 'The child moved briskly at first, but remained quiet afterwards, except when the tumor was pressed, which occasioned general convulsions. It breathed naturally and was not observed to be deficient in warmth until its powers declined. I regret that, from fear of alarming the mother, no attempt was made to see whether it would take the breast. A little food was given it by the hand. It voided urine twice the first day, and once a day afterwards. It had three dark-colored evacuations. The medulla spinalis was continued for about an inch above the foramen magnum, swelling out into a small bulb, which formed the soft tumor on the base of the skull. All the nerves from the fifth to the ninth were connected to this.' This brief detail is full of interest. The respiration was natural, the medulla oblongata being entire. Swallowing was affected when food was brought into contact with the pharynx; the sphincters performed their functions; the limbs were moved when the skin was first impressed by atmospheric air There was no indication of sensation, the child remained quiet after the first brisk movements, and no event is mentioned which could establish the existence of voluntary motion. The acts of swallowing and of the expulsion of the urine and fæces, with the functions of the larynx and of the sphincters, belong distinctly to the excito-motory system."

[23] Oeuvres de Legallois avec des notes de M. Pariset. (Paris, 1824, t. I., p. 64.)

"Respiration does not depend upon the whole brain, but upon a quite circumscribed part of the medulla oblongata, which is situated at a little distance from the occipital foramen and toward the original of the nerves of the eighth pair (or pneumogastrics). For if one opens the cranium of a young rabbit and extracts the brain by successive portions, from before backward, by cutting slices, one can remove in this manner all of the brain, so called, and afterwards all of the cerebellum and a portion of the medulla oblongata. But it (respiration) ceases suddenly when one comes to include in the section the origin of the nerves of the eighth pair."

[24] Recherches Expérimentales sur les Propriétés et les Functions du Système Nerveux dans les Animaux Vertébrés par P. Flourens. (Paris, 1842, p. 55.)

"GENERAL CONCLUSIONS OF THE CHAPTER.

"SEC. VI. 1. The results obtained upon reptiles and mammals reproduce then and confirm the results given by birds:

"With destruction of the cerebral lobes coincides constantly loss of volition and perception;

"With destruction of a single lobe, loss of vision in the opposite eye;

"With the destruction of the cerebellum, loss (of the power) of jumping, flight, walking, standing, etc.;

"With destruction of the medulla oblongata, of the spinal cord, of the nerves (coincides), loss of muscular contraction and, in consequence, loss of movement, and death.

"2. Contractions, the immediate excitation of contractions, the association of these contractions in movements of the whole body, the coordination of these movements in jumping, flying, walking, or standing, etc., the willing of these movements, sensations, perceptions, all these phenomena are then independent; the organs from which they are derived, distinct; their isolation, manifest; their localization, demonstrated."

§ II, page 189: "1. We have seen in the preceding chapter that the medulla oblongata is, in all these classes (mammals, birds, frogs, reptiles, and fishes), the organ which is the prime mover or the chief exciter and regulator of the inspiratory movements. It is, moreover, in all these classes, the organ immediately productive, through the nerves, of the inspiratory movements, particularly of the face and head; lastly, it is, in fine, in fishes, as I shall show, the prime moving organ, and the organ immediately productive of all respiratory movements.

"2. The medulla oblongata is then, in all the classes, the essential and primordial organ of the respiratory mechanism; it is the exclusive organ of this mechanism in fishes."

([25]) An account of Mr. Hunter's method of performing the operation for the cure of popliteal aneurism. Sir Everard Home, bart. (Works of John Hunter, with notes by J. F. Palmer. 4 vols. London, 1835. Vol. iii, p. 596.)

Mr. Hunter, finding an alteration of structure in the coats of the artery previous to its dilatation, and that the artery immediately above the sac seldom unites when tied up in the operation for aneurism, so that as soon as the ligature comes away the secondary bleeding destroys the patient, was led to conclude that a previous

disease took place in the coats of the artery, in consequence of which it admitted of dilation capable of producing an aneurism. But not satisfied with the experiments on frogs given by Haller, in support of the opinion that weakness alone was sufficient to produce the dilatation, he resolved to try the result in a quadruped, which, from the vessels being very similar in structure to those of the human subject, would be more likely to ascertain the truth or fallacy of Haller's opinion.

Mr. Hunter's account of the experiment (ibid., vol. i, p. 544):

"However, whatever may have been either the remote or immediate cause" (of aneurism), "it must, in fact, in all cases arise from a disproportion between the force of the blood and the strength of the artery, the coats being weakened so as not to be able to support the force of the blood in its passage along its canal, which therefore gives away. This weakness of the coats of the artery would appear, in most cases, to depend on disease, for accidents, coeteris paribus, have generally the power of recovery. As a proof of this, I will relate an experiment made to ascertain the truth of the existence of the mixed kind" (of aneurism), "which was supposed to arise from a partial destruction of the coats of an artery, and that the remaining coat being too weak to sustain the force of the circulation, gave way and distended. That the artery might have the full force of the blood's motion, I chose the carotid, as being near the heart.

"One of the carotid arteries of a dog, for an inch in length, was laid bare, and its coat removed, layer after layer, until the blood was seen through the remaining transparent coat, and I had gone as far as I dared; I then left the artery alone for three weeks, when I killed the dog, expecting to find a dilatation of the artery as had been asserted; but to my surprise the sides of the wound had closed on the artery, and the whole was consolidated to and over it, forming a strong bond of union, so that the whole was stronger than ever."

Volume III, page 598: "Mr. Hunter, from having made these observations, was led to propose that in this operation" (for popliteal aneurism) "the artery should be taken up in the anterior part of the thigh, at some distance from the diseased part, so as to diminish the risk of hemorrhage, and admit of the artery being more readily secured, should any such accident happen. The force of the circulation being thus taken off from the aneurismal sac, the progress of the disease would be stopped; and he thought it probable that, if the parts were left to themselves, the sac, with its contents, might be absorbed, and the whole of the tumor removed, which would render any opening into the sac unnecessary.

"Experiments and observations on the growth of bones, from the papers of the late Mr. Hunter." (Published by Mr. (afterwards Sir Everard) Home, in the second volume of the Transactions of the Society for the Improvement of Medical and Chirurgical Knowledge.) (Ibid., vol. iv, p. 315.) Read October 4, 1798:

"It was some time anterior to the year 1772 that Mr. Hunter began to investigate this subject, and an account of the experiments and observations was given to me to copy in that year, as a part of his future lectures.

"Du Hamel has published a very ingenious theory upon the growth of bones, which he endeavored to support by experiments tending to prove that bones grow by the extension of their parts. With this doctrine Mr. Hunter was not satisfied, and instituted experiments to determine the truth of Du Hamel's opinion.

"Mr. Hunter began his experiments by feeding animals with madder, which has the property of tinging with a red color that part only of the bone which is added while the animal is confined to this particular food. He fed two pigs with madder for a fortnight, and at the end of that period one of them was killed; the bones, upon examination externally, had a red appearance; when sections were made of them, the exterior part was found to be principally colored, and the interior was much less tinged.

"The other pig was allowed to live for a fortnight longer, but had no madder in its food; it was then killed, and the exterior part of the bones was found of the natural color, but the interior was red.

"He made many other experiments of the same kind upon the increase of the thickness of the neck and head of the thigh bone. From thence it appeared that the addition of new matter was made to the upper surface, and a proportional quantity of the old removed from the lower, so as to keep the neck of the same form and relatively in its place.

"To ascertain that the cylindrical bones are not elongated, by new matter being interposed in the interstices of the old, he made the following experiment: He bored two holes in the tibia of a pig, one near the upper end and the other near the lower; the space between the holes was exactly 2 inches; a small leaden shot was inserted into each hole. When the bone had been increased in its length by the growth of the animal the pig was killed, and the space within the two shot was also exactly 2 inches.

"This experiment was repeated several times on different pigs, but the space between the two shot was never increased during the growth of the bone.

"Besides these experiments on the growth of bones, he made others to determine the process of their exfoliation."

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"Bones, according to Mr. Hunter's doctrine, grew by two processes going on at the same time and assisting each other; the arteries bring the supplies to the bone for its increase; the absorbents are at the same time employed in removing portions of the old bone so as to give to the new the proper form. By these means the bone becomes larger without having any material change produced in its external shape."

[26] Experiments and Observations on the Union of Fractured Bones. By John Howship, esq. Read March 17, 1817. (Medico-Chirurgical Transactions. London, 1818, vol. ix, p. 143.)

Page 145: "The following experiments were made upon rabbits, selected at about the age of 12 months, the period at which, from their beginning to bear young, they may be considered to have nearly attained their full growth."

Six experiments were performed.

Page 170: "Having at length completed the account of my obsevations upon fracture, I shall now lay before the society the conclusions drawn from the above inquiry, which will close the present paper.

"The first effect of fracture is extravasation of blood into the surrounding soft parts, the quantity poured out varying according to the degree of contusion or complication."

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Page 171: "The blood effused in fracture suffers various degrees of change; but under all circumstances it forms the medium in which the ossific process is established."

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Page 172: "The mode of progress in the ossific process seems to indicate a degree of caution, as if a principal object was to guard against the possibility of the least disturbance or motion between the parts of the bone subsequent to the act of union."

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The circumstances of the fracture evidently regulate the quantity and seats of the ossific deposit. In simple transverse fracture with little contusion where the bone is immediately reduced and the limb kept perfectly quiet the degree of internal laceration will be small, the effusion of blood inconsiderable, and the ultimate deposit of bone moderate in proportion."

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Page 173: "In oblique fracture, where the bones have suffered more violence at the moment of accident and are retained with more difficulty when reduced, the effusion of blood will be greater, and the quantity of ossific matter formed will be also more abundant."

[27] Flourens P. Récherches sur la formation des os. (Compt. rend Acad. d. Sc., Paris, 1844, xix, 621–625.)

[28] Heine, B. Ueber die Wiedererzeugung neuer Knochenmasse, und Bildung never Knochen. (J. d. Chir. u. Augenh. Berlin, 1836, xxiv, 513–527, also Gaz. Méd. de Paris, 1837, v. 386–388.)

[29] Syme. Trans. Roy. Soc. Edin., 1836, vol. xiv, p. 158.

[30] Ollier, L. Des moyens chirurgicaux de favoriser la reproduction des os après les résections; de la conservation du périoste; résections sous-périostées; de la conservation de la couche osseuse périphirique; evidement des os. (Gaz. hebdom. de Méd. Paris, 1658, v. 572, 651, 733, 769, 853, 899.)

Ollier, L. Récherches experimentales sur la production artificielle des os, ou moyen de la transplantation due périoste et sur la régénération des os, après les résections et les ablations completes. (J. de la physiol. de l'homme, Par., 1859, ii, 1169, 468.)

Ollier, L. De la transplantation des éléments anatomiques du blastème sous-périosteal; formation des petitess grains osseux dans la region où ont été semés ces éléments. (Compt. rend. Soc. de biol., Par., 1860, 3 s., i, 108.)

Ollier, L. Nouvelle démonstration de la régénération osseuse après les résections sous-périostées articulaires. (Bull. gen. de thérap., etc., Paris, 1870, lxxix, 258–261.)

Du Perioste au Point de Vue Physiologique et Chirurgical, communication faite au congrès medical de Lyons le 28 September, 1864, par M. Ollier, chirurgien en chef de l'Hôtel-Dieu de Lyon. (Gaz. hebdom. de Méd., Paris, 1863, 2 s., ii, 82, 116, 152, 195.)

"Proposition first: That the periosteum produces osseous tissue by a normal development, in the order of its proper anatomic elements. The deeper layer, composed of protoplasmic cells, possesses this property, and to this layer I have given the name osteogenic."

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"I first repeated the experiments of my predecessors, but in studying the rôle of the periosteum with Du Hamel in fracture, or Heine and M. Flourens in resections, I have recognized that it was difficult to determine the part played by the divers elements of the bone in the act of reproductions."

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"I isolated the different tissues; I studied them separately, either in their normal situation, preserving the while their anatomic relations, or displacing and transplanting them into distant regions. I experimented with the periosteum, the marrow, cartilage, bone, and the adjacent tissues, muscles, and tendons, and I arrived at results which permit the setting forth of propositions which I believe sufficiently exact to prevent all controversy.

"I commenced with the periosteum, which I detached from the bone; I first dissected up a piece of this membrane, 5 or 6 centimeters long, from the tibia of a rabbit; I rolled it around the limb amongst the muscles and under the skin, and I obtained bone, or rather osseous prolongations of varied form. I produced bone in a circle, in a spiral, in a cross, etc., and finally I gave to the new bone any form I desired, and for this purpose I had but to fix the periosteum in a predetermined way; after from twenty to twenty-five days (in the rabbit, the cat, or the dog) I found new bone of the form of periosteum, or to speak more correctly, I found the periosteum ossified.

"This experiment seemed to me fundamental; it furnished simple and irrefutable proof of the osteogenic property of the periosteum; and it answered the greater part of the objections which had been offered to the doctrine of Du Hamel, from the time of Haller to Bichat.

"It proved that the periosteum produces bone of itself, independently of the neighboring tissues; and from a surgical point of view it promised new resources in autoplasty; it also showed us the manner in which ossification takes place in abnormal regions. But I did not stop at this first experiment, which I saw was so signal. Being anxious to obtain results of surgical value I modified it so as to make it still more convincing, and by means of it answered all objections that it was possible for me to foresee.

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"After having detached and fixed my shred of periosteum among the muscles, I left it to live, or at least to form certain adhesions during three or four days; then, finding that it had become ossified, I detached from the bone 4 or 5 mm. of the entire depth of the periosteum in a manner to interrupt all connection between the periosteum and bone. I established then, that, in spite of this interruption, the periosteum continued to ossify, and that new bone, independently of the normal bone, was formed there.

"But this did not yet satisfy me. To answer at once all possible objections, I conceived the idea of transplanting the periosteum into distant regions, immediately after its separation from the bone.

"I transplanted it from the leg to the forehead or back, and I saw that this membrane carried with it everywhere its osteogenic property. Everywhere I engrafted the periosteum new bone was formed; this was not an unformed mass of calcareous particles, but a bone formed of the characteristic elements of osseous tissue, hollowing itself out into spaces in its interior, and having after a certain time a veritable canal containing medullary substance, and surrounded by a compact layer."

[31] Mr. Rand. A New Method for the Treatment of Neuralgia by Subcutaneous Injection, 1855.

[32] John Hunter, loc. cit.

[33] A Treatise on the Process Employed by Nature in Suppressing Hemorrhage from Divided and Punctured Arteries. (J. F. D. Jones. 8°, Lond., 1802.)

I have been unable to find the above treatise, but the following account of the experiments is given by Travers, loc. cit., page 440:

"Jones ascertained that the effusion of lymph from the wound inflicted by the ligature was sufficient, even if the ligature were removed upon the instant to obstruct the artery. By including a loose thread along with the artery in the ligature he readily withdrew the latter after the infliction of the wound. In one instance he succeeded with a single ligature, and in several instances with two, three, or four, made at a small distance apart. The lymph effused was in proportion to the extent of the section, or if this was incomplete, the union was equally so. He was led to conclude that the complete circular section of the internal coat was indispensable to union, and the success which attended his experiments led him to conjecture that in some surgical cases removing the ligature as soon as it was made would be an efficient operation. This suggestion, the value of which he left to be determined by future experiments, was caught at with eagerness by his readers, and by many considered to be the essence of his publications."

In a footnote the following quotation is given from Jones, page 136:

"I leave the fact, viz.—(the complete obstruction of an artery consequent upon the

momentary application of a ligature), for those who have opportunities of applying it in practice when all the circumstances which determine its success or failure shall have been fully ascertained by further experiments on brutes."

[34] "Observations upon the ligature of arteries and the causes of secondary hemorrhage." Benjamin Travers. (Medico-Chirurgical Transactions, vol. iv, p. 435.) Read October 26, 1813.

Page 439: "It is curious to observe the revolution which has taken place within a few years in this branch of surgical practice since experimental inquiry has furnished the true explanation of the principle upon which the ligature acts. Mr. Hunter and the surgeons who after him practiced the operation for popliteal aneurism were in the habit of applying the ligature with force only sufficient to bring the sides of the vessel in contact; and some included an extraneous body, as a piece of cork or wood or a roll of linen, to prevent the lesion of the artery in the act of tightening the ligature. The fear of cutting the coats of the artery was uppermost in the minds of all, and next to this the fear of quickening the process of ulceration and the casting off of the ligature."

Page 443: "The original experiment of Jones, in whatever light we view it, is of unquestionable importance, and deserves to be highly appreciated. While its occasional failure demonstrates that the apposition of the cut surfaces is essential to the certain obliteration of the vessel, its occasional success establishes that, coeteris paribus, it can not with this precaution fail of its intention." As a basis for the statements made in this paper, Travers performed five experiments upon the ligaturing of arteries, using the ass, dog, and horse.

In another paper on the same subject, which appears in Volume VI of the Transactions of the Medico-Chirurgical Society, page 632, he records nineteen other experiments.

The first eight were undertaken "to ascertain the earliest period at which the ligature might be removed and the artery wounded without hemorrhage."

Page 643: "The experiments next to be related give the operation of the compressor, and were undertaken with a view to determine its merits as a surgical instrument, comparatively with the ligature. Professor Assalini, of Milan, who lately visited this country, entertains a preference for the practice of compression in the operation for aneurism. He had employed it with success in three cases of popliteal aneurism."

Experiment XV.—"I wished to know the effect of leaving the compressor upon the vessel and the time in which it was liberated by ulceration."

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Page 658: "In contemplating the removal of the ligature at a given time it becomes essential to ascertain if this can be done with equal security when a branch is contiguous as when at a distance. With this view I made the following experiments (Exp. XVI–XIX):

* * * * * * *

Page 662: "The practical application of the facts and deductions contained in this and my former essay (Vol. IV) will probably be the subject of a future communication to the society.

"It is, however, in my judgment, a subject too important to be lightly disposed of; and it carries with it, in reference to surgical practice, a responsibility too serious to justify a rude and hurried trial of its merits."

[35] "On the torsion of arteries as a means of arresting hemorrhage, with experiments." By Thomas Bryant, F. R. C. S. (Medico-Chirurgical Transactions, 1868, vol. li, p. 199.)

Page 203: "I propose to relate seriatim the experiments I have made upon the dog, horse, and human subjects to test the value of torsion, and to observe the process by which the vessels so treated become permanently sealed."

* * * * * * *

Experiment 1 (*February 4, 1868*).—"I divided the left *femoral artery* of a dog just below Poupart's ligament, and twisted the cardiac end by 'free' torsion *four* times with success. During this time the distal end was held by forceps and when these were removed hemorrhage occurred; the bleeding extremity was, however, seized by forceps and twisted four complete revolutions; all bleeding at once ceased, and by the seventh day the wound had united.

"The dog was killed the 11th day after the operation."

* * * * * * *

Experiment IV (*February 11, 1868*).—"I cut down upon and divided the right *common carotid* artery of a dog. I applied 'free' torsion to the cardiac end, making three revolutions without success, and accordingly seized the vessel again and twisted it four times more. Hemorrhage was at once arrested. *Three* complete twists were then given to the distal end of the artery and no bleeding followed.

"On the second day the dog was quite well, he had taken his food as usual, and appeared in no way disturbed by the operation. On the following day the animal was destroyed.

"It must be noticed that in this case, as in the second experiment, three rotations of the artery were not sufficient to arrest bleeding; four proved successful in both cases."

* * * * * * *

Experiment VII (*March 17, 1868*).—"I cut down upon and divided the left *common carotid* artery of a horse; applied two pairs of torsion forceps transversely to the vessel, and divided the artery midway between them, leaving an inch of artery on the distal side of each pair of forceps. With a third pair of torsion forceps I then seized the extremity of the artery at its cardic end, and twisted it *seven* complete revolutions. I then removed the instrument that fixed the vessel, and not a drop of blood escaped; the pulsations in the vessel were very strong. The same treatment was then applied to the distal end with a like result. It was certainly something astonishing to see the great vessel fill out and pulsate after the operation without one drop of blood escaping; and although the animal plunged somewhat during and after the operation, the success was most complete. The animal was allowed to live for forty-eight hours, and then killed."

[36] Rayer and Davaine. (Bull de la Soc. de Biol. de Paris, 1850.)

"In the blood are found little thread-like bodies about twice the length of a blood corpuscle. Those little bodies exhibit no spontaneous motion." However, no importance was attached to their presence.

Davaine. Nouvelles recherches sur les infusiores du sang dans la maladie connune sous le nom de sang de rate. (Compt. rend. Soc. de Biol. 1863. Par. 1864, 3 S. V., 149-152.)

[37] The life of the Trichina. (Monograph) 1864, p. 21. By Rudolph Virchow, M. D., Ph. D. Translated by Rufus King Brown, M. D.

The author states that he received from Dr. Zenker some of the muscle of a girl who died of trichinosis and also some of the flesh of the pig that caused her disease.

"A rabbit fed with the trichina from the girl died in a month with its flesh full of them. Some of its flesh was given to a second rabbit. It also died in a month. With this meat three other rabbits were fed. Of these, two died at the end of the third week, and the other in the fourth week. To another animal the meat of this was fed. As it ate but little it lived six weeks. In all these the muscles after death were found filled with trichina: Even in the smallest particle of their meat several were found."

[38] Cause and nature of tuberculosis. J. A. Villemin. Gaz. hebdom. de med. Par. 1865, 2 s., ii, 795.

1. "Tuberculosis is the effect of a specific agent, of a virus, in a word.

2. "This agent should be found, as its congeners, in the morbid products which it gives rise to by a direct action upon the normal elements of the tissues affected.

3. "Introduced into an organism susceptible to it, this agent should then reproduce itself, and reproduce, at the same time, the disease of which it is the essential and determining cause.

"Experimentation is undertaken to confirm these inductive conclusions. The results are as follows:

"First series: Of two rabbits one is inoculated with two little fragments of tubercular tissue and pus from a lung cavity. The other is kept as a control. The two were placed under like conditions of existence. At the autopsies the inoculated rabbit was found to be infected, while its mate showed absolutely no sign of tubercle.

"Second series: Four rabbits were inoculated with tubercular matter, and when killed all of them were found infected. Two other rabbits, which had been kept with these and afterwards used for physiologic purposes, presented no trace of tuberculization."

From these experiments Villemin draws the following conclusions:

1. Pulmonary phthisis (as tubercular diseases in general) is a specific infection.
2. Its cause is an inoculable agent.
3. The inoculation can easily be made from man to the rabbit.
4. Tuberculosis belongs, then, to the class of virulent diseases, and should have a place in the nosologic table, along with syphilis, but better, perhaps, with glanders and farcy.

Continuing his experiments to the third series, three pairs of rabbits were taken and one of each pair inoculated. Two of the pairs are put in the same cage. At the autopsies those not inoculated show no signs of tuberculosis.

[39] De l'atténuation du virus du choléra des poules, par M. L. Pasteur. (Comptes Rendus, t. xci., p. 673.)

Chamberland. Le charbon et la vaccination charbonneuse d'après les travaux recents de M. Pasteur. (Paris, Tignol, 1883, p. 9 et seq. Translation for New Sydenham Society, 1886, p. 551 et seq.)

"The experiments were commenced in the early days of August, 1878. They consisted at first in feeding certain lots of sheep with lucerne which had been watered with artificial cultivations of the bacterium of anthrax full of the parasite and its spores. Notwithstanding the immense number of the spores of the bacterium swallowed by all the sheep of each lot, many of them, often after having been distinctly ill, escaped death. A smaller number died with all the symptoms of spontaneous anthrax after a period of incubation which might extend to eight or ten days, although at the end the disease took on the almost sudden characters frequently noted by observers, who have thus been led to believe in a very short period of incubation.

"The mortality was increased by mixing with the food, sprinkled with the spores, sharp-pointed objects, especially the pointed extremities of the leaves of dried thistles, and above all the beards of ears of barley cut into small fragments about a millimeter long.

"It was of great importance to ascertain whether the autopsy of animals dying under these conditions would show similar lesions to those observed in animals dying spontaneously in stables, or in flocks penned in the open air. The lesions in the two cases are identical, and their nature authorized the conclusion that the disease begins in the mouth or pharynx."

De l'atténuation des virus et de leur retour à la virulence, par M. L. Pasteur avec la collaboration de MM. Chamberland et Roux. (Comptes Rendus, t. xcii, p. 429.)

"I have made known in papers recently published the first example of the attenuation of a virus by experimental means alone. It seems probable that the oxygen of the air is the chief cause of these attenuations, that is to say, of these diminutions in the facility with which the microbe multiplies; for it is clear that the various degrees of virulence are identified with the varying power of the parisite to develop in the economy. The virus of anthrax, being one of the best studied, must be the first to attract our attention. A mycelial growth of the bacterium entirely free from spores can be maintained in contact with pure air at a temperature between 42° C. and 43° C.

"After an interval of about one month the cultivation is found to be dead, that is to say, fresh broth inoculated with it remains completely sterile. On the day before that on which inability to grow is noted, and on every preceding day during the month, reproduction of the growth is, on the contrary, easy.

"With regard to its virulence, we discover this remarkable fact: After remaining for eight days at a temperature of 42° to 43° C., and ever afterwards, the bacterium has lost its virulence; at least its cultivations are inocuous to the guinea pig, the rabbit, and the sheep, three of the animals most likely to contact splenic fever. We are, therefore, by using a simple artifice in cultivating, able to produce not merely an attenuation of virulence, but a suppression which is apparently complete. More than this, we have the power of preserving and cultivating the terrible microbe in this inoffensive condition."

EXPERIMENTAL APPLICATION OF THE METHOD (OF INDUCING IMMUNITY).

"M. Pasteur proposed that 60 sheep should be used for this experiment, and consented that the request be made of the president of the Agricultural Society to extend the experiment to 10 cows. He foretold that all sheep not protected by inoculation of attenuated virus would die, and that all the cows not so protected would be at least made ill, and that some would die when inoculated with a very virulent virus, while all the protected sheep would survive the inoculation with this very virulent virus, and that the cows would not be made ill. Ten sheep were not to be dealt with in any way, but kept for ultimate comparison with the inoculated sheep."

For further work done by Pasteur on immunity consult Sur la rage, par M. Pasteur avec la collaboration de MM. Chamberland et Roux (Comptes Rendus, t. xcviii, p. 1229) and Méthode pour prevenir la rage après morsure, par M. L. Pasteur. (Ibid., t. ci, p. 766.)

[40] The Etiology of Tuberculosis, by Dr. Robert Koch. Translated by Mr. Stanley Boyd in Microparasites in Disease, pages 157–160. Infection experiments with tissue containing tubercle bacilli:

"The inoculation was effected by making a small incision in the abdominal wall of a guinea pig with the scissors, inserting the point of the scissors to form a pocket-like subcutaneous wound about a half centimeter deep. Into this little pocket a fragment of the inoculation substance about the size of a millet or mustard seed was pushed as deeply as possible. On the following day the inoculation wound was always united, glued together, and showed no reaction. Generally it was not till after a couple of weeks that a visible swelling of the lymphatic glands next the seat

of inoculation occurred, usually the inguinal glands on one side, and at the same time induration and the development of a nodule took place in the inoculated wound, which up till then had remained perfectly healed. After this the lymphatic glands enlarged rapidly, frequently to the size of a hazelnut, the nodule at the seat of inoculation then generally broke, and became covered with a dry crust, beneath which was a flat ulcer with a cheesy floor, discharging very slightly. The animals began to lose flesh about this time, their coat became bristly, dyspnœa set in, and they died generally between the fourth and eighth weeks, or they were killed within the same space of time. In some instances the inoculation substance was inserted into a pocket-like wound in the skin of a rabbit also. But, as the course of the disease was not so constant and rapid as in the guinea pigs after subcutaneous inoculation, I inoculated rabbits afterwards only in the anterior chamber of the eye.

"The following inoculations were carried out in the way above described:

"1. Miliary tuberculosis: Tubercle of the pia mater, very rich in tubercle bacilli; 6 guinea pigs. Of these 1 died five, 2 six, and 2 seven weeks after inoculation. The sixth was killed in the eighth week. In all the animals the lungs, liver, and spleen were highly tubercular, and the inguinal glands had undergone caseation.

"2. Miliary tuberculosis: Gray nodules in the lungs, with fairly numerous tubercle bacilli; 6 guinea pigs. Three died in the sixth week; the rest were killed some days later. All tubercular, as in No. 1.

"3. Miliary tuberculosis: Grayish yellow nodules from the spleen and kidneys, with not many tubercle bacilli; 6 guinea pigs. Died in the sixth and seventh weeks. All tubercular, as in No. 1.

"4. Miliary tuberculosis: Gray nodules from the lung, fairly rich in bacilli; 3 guinea pigs. Two died in the sixth, 1 in the seventh week. All tubercular, as in No. 1.

"5. Miliary tuberculosis: Gray nodules from the lung containing few bacilli; 5 guinea pigs, 2 rabbits, at the root of the ear. One guinea pig died after eight weeks; the remainder were killed some days later. All were tubercular. The rabbits killed after ten weeks had caseous lymphatic glands at the root of the ear and in the neck, tolerably abundant gray nodules in the lungs, a few in the kidneys and the spleen. Five more guinea pigs were inoculated with the tubercles from the spleen of one of the guinea pigs. Three of these died in the eighth week. The two remaining were killed the same week, and all found tubercular. Some of the cheesy glandular substance from a rabbit was rubbed up with water and injected into the peritoneal cavity in two rabbits. When these two animals were killed after eight weeks tuberculosis of the omentum, spleen, and liver was found, together with a fair number of gray nodules in both lungs.

"6. Caseous pneumonia and tuberculosis of the meninges: Two guinea pigs inoculated with the cheesy substance from the lungs, in which there were numbers of bacilli. The animals died in the fifth and sixth weeks. All tubercular.

"7. Lungs showing caseous infiltration with many bacilli: Six guinea pigs. The first died after six weeks. The remainder were very ill at the time and were killed a few days later. All tubercular.

"8. Phthisical lungs with cavities, intestinal ulcers, and cheesy mesenteric glands: Two guinea pigs were inoculated from the contents of cavity containing a fair number of bacilli, and four more from the mesenteric glands, which were very full of bacilli. The latter died in the fifth and sixth weeks. Of the first two, one died in the sixth week and the other was killed a few days later. All tubercular.

"9. Caseous bronchitis and intestinal tuberculosis: Five guinea pigs were inoculated from the lung substance, in which there was a good number of bacilli. Two of them died in the eighth week. The remainder were killed before the end of the same week. All tubercular.

"10. Phthisical lungs with cavities: Four guinea pigs inoculated from the consolidated lung tissue, in which were only a few bacilli. Three of them died in the seventh and eighth weeks, the last not till the twelfth week. All tubercular.

"11. Phthisical sputum: Nine guinea pigs were inoculated at different times with fresh sputum containing a varying number of tubercle bacilli taken from three different patients. Some of the animals died before the eighth week. Some were then killed. They were all tubercular.

"12. Phthisical sputum dried for two weeks: Three guinea pigs. Two died in the sixth week. The third was killed at the same time. All tubercular.

"13. Phthisical sputum dried for two months: Three guinea pigs, killed after five weeks, and tubercles found in lungs, liver, and spleen.

"14. Tuberculosis of the uterus and tubes: Six guinea pigs inoculated with cheesy material from the tubes. Two animals died at seven weeks. The others were killed in the ninth week. All tubercular.

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"28. With lung tubercles from a second monkey, dying of spontaneous tuberculosis, two guinea pigs were inoculated and died of tuberculosis in the eighth and ninth weeks. From these guinea pigs again two guinea pigs and one rabbit were

inoculated. They were killed in the sixth week, as they seemed already ill, and they were found to be already tubercular.

"Two more guinea pigs were inoculated from the same monkey with lung tubercles which had been dried and kept for three days. They, too, were killed in the sixth week, and found tubercular. For the infection experiments just detailed (including 13 not quoted) 79 guinea pigs, 35 rabbits, and 4 cats were used altogether, and the inoculation of these animals resulted in tuberculosis without exception."

[41 and 42] Experiments on the immunity and cure of tetanus in animals. (Zeitschr. f. Hygiene u. Infections-Krankheiten. 12, 1892, 45-57. By Dr. Behring.)

"In November, 1890, I, in an announcement with Mr. Kitasato, stated that with the blood of a rabbit rendered immune from tetanus, we could prevent mice from taking the disease, and if they had been infected we could cure them.

"The certainty of the cure and the immunity of even such animals as had received more than a hundred times the dose of the fatal infection, exceeded our greatest expectation. If in the manipulation no technical mistakes were made, unfavorable results were entirely excluded."

Here the author states that the practicality of this method was suggested by his experiments in diphtheria, and that he and Dr. Kitasato arranged to do all they could to perfect the new method so it could be used for larger animals than mice, and especially that it might be used to render the human body immune from tetanus. They were stimulated to their research by the belief that they had a method which was applicable to different infectious diseases. Drs. Kitasato and Behring carried on their investigations separately, but each assisted the other where possible.

The successful use of ICl_3 in diphtheria led Dr. Behring to apply it for the purpose of rendering immune from tetanus.

The author states that the experiments upon rabbits were very successful, and that the experiments were among the easier tasks which a bacteriologist had to perform. The first requisite of success being an exact knowledge of the action of the culture relatively to the filtrate. In one month Dr. Behring received eight cultures from Dr. Kitasato and tested the effectiveness of them on mice and rabbits. He gives an account of the last of these cultures. It was received November 15, 1891, in bouillon and stood in the culture ten days.

"Upon opening the paraffin the odor characteristic of tetanus was given off, and a microscopical examination revealed an abundance of bacteria and spores."

[43] Archiv fur Anatomie. 1870. On the electrical irritability of the cerebrum. By G. Fritsch and E. Hitzig.

Page 308: "In the first experiment we used unnarcotized animals—dogs—but later narcotized, and proceeded to open the skull in as level a spot as possible. Then with the sharp, round bone forceps we removed either the entire half of the skull, or only the part covering the frontal lobe of the brain.

"In most cases after experimenting on one hemisphere we removed the other half of the skull in exactly the same way. In all these cases, after one dog had died of hemorrhage through a small injury to the longitudinal sinus, we left a long bridge of bone to protect it.

"Now the dura, which had been left intact thus far, was slightly cut and grasped with the forceps and laid back to the edge of the skull. Hereupon the dog expressed violent pain by whining and characteristic twitchings.

"But later, when it had been exposed to the air for a longer time, the remainder of the dura mater was rendered far more sensitive, a circumstance which in carrying out the experiment had to be taken carefully into consideration. However, we could shock in any degree the pia, through mechanical or any other irritation, without the animal manifesting sensation."

After giving a description of the electrical apparatus used, the authors continue:

"The following are the results which we give as a summary of a very great number of experiments on the brain of the dog, which harmonize for the most part to the minutest detail, without describing all the experiments:

"A part of the convexity of the cerebrum of the dog is motor, and another part is not motor. The motor part is placed, as it is generally expressed, more to the front, the nonmotor lies toward the back.

"Through the electric stimuli of the motor part one obtains combined muscle contraction of the opposite half of the body."

[44] Ferrier. Functions of the brain. 1886, p. xxii.

The following resolutions regarding vivisection were adopted by the Congress of American Physicians and Surgeons, and are respectfully called to the attention of your committee:

[Transactions of the Congress of American Physicians and Surgeons, Vol. III, 1894, p. XXI.]

Dr. William H. Welch, of Johns Hopkins University, called attention to the fact that a bill had been presented in Congress forbidding experimentation on animals

in the District of Columbia, and there was a probability of the favorable report of the bill. He moved the adoption of the following, viz:

Whereas the attempts in other countries to regulate by legislation the practice of experimentation upon animals have proven most disastrous to the progress of medical science and art:

Resolved, That the Congress of American Physicians and Surgeons enter their most earnest protest against any legislation tending to interfere with the advancement of medicine by means of experiments upon animals conducted by properly qualified persons.

Resolved, That a copy of these regulations, signed by the president and secretary of this Congress, be sent to the Speaker of the House and presiding officer of the Senate, and to the proper committees of the Senate and House.

The resolutions were adopted.

The papers which I have thus far submitted treat the subject from a general standpoint, while the following resolutions, adopted by the Joint Commission of the seven Scientific Societies of Washington, refer directly to the bill now before Congress:

Resolved, That the joint commission of the scientific societies of Washington, composed of the officers of the several scientific societies of the city, most earnestly opposes the legislation proposed by Senate bill 1552, entitled "A bill for the further prevention of cruelty to animals in the District of Columbia."

Resolved, That in the opinion of this commission the proposed legislation is unnecessary and would seriously interfere with the advancement of biological science in this District; that it would be especially harmful in its restriction of experiments relating to the cause, prevention, and cure of the infectious diseases of man and of the lower animals; that the researches made in this department of biological and medical science have been of immense benefit to the human race, and that, in general, our knowledge of physiology, of toxicology, and of pathology, forming the basis of scientific medicine, has been largely obtained by experiments upon living animals, and could have been obtained in no other way.

Resolved, That physicians and others who are engaged in research work having for its object the extension of human knowledge and the prevention and cure of disease are the best judges of the character of the experiments required and of the necessity of using anæsthetics, and that in our judgment they may be trusted to conduct such experiments in a humane manner, and to give anæsthetics when required to prevent pain. To subject them to penalties and espionage, as is proposed by the bill under consideration, would, we think, be an unjust and unmerited reflection upon a class of men who are entitled to our highest consideration.

Resolved, That a copy of these resolutions be sent to each member of the Committee on the District of Columbia in the House of Representatives and the Senate of the United States, and to the District Commissioners.

I certify that the foregoing is a correct copy of resolutions passed by the joint commission of the scientific societies of Washington at the meeting held on February 19, 1896.

J. STANLEY-BROWN, *Secretary*.

The following editorial in the Medical News of February 15, 1896, also refers directly to Senate bill 1552:

THE ANTIVIVISECTION BILL IN CONGRESS.

In another column we print a detailed account, by our special correspondent, of the hearing before the District Commissioners on Senate bill 1552, to which we invite the careful consideration of the medical and scientific professions. The bill is printed in full, together with a list of the Senate and House committees through whose hands this bill will pass before it reaches the floor for general consideration. These details are given with a purpose. First of all, the medical men of the country should know the exact contents of the bill, and the edition printed by Congress is so limited that it is impossible for our Washington confrères to obtain a sufficient number of copies for distribution. In the next place, it is important for the medical profession to know exactly who the Senators and Congressmen are to whom this bill has been referred for careful consideration. These Senators and Congressmen should be informed by the medical and scientific men of their respective States of the absolute absurdity of this bill and of its injustice to science, and we urge that members of the profession in the States from which these Senators and Representatives come take immediate action and bring the proper information to the attention of each and every member of the two committees.

The suggestion made by our special correspondent that this movement in Washing-

ton may be the beginning of a national movement is worthy of attention. The bill, though primarily intended for the District of Columbia, is not one of merely local interest, and if not killed in committee will give the antivivisectors in various parts of the country an unduly exaggerated idea of the justice (!) of their movement. This local bill is one of national interest to the medical profession. If it is reported to the Senate and the House we may expect to see similar and even more radical bills presented to many of the State legislatures within a short time. Let us all unite, therefore, in making a national fight at Washington, and in giving this bill such a severe and total defeat that it will never again be allowed to see daylight.

We desire to call particular attention to several points in the bill. First of all, the bill is misnamed. The title should read: "A bill for the prevention of advance in medical science in the District of Columbia, and for the prevention of the application of discoveries already made." This exactly expresses the result the bill would attain if allowed to become a law. The question naturally arises whether the bill could be amended so as to suit all parties. To this we reply in the most emphatic language, No! The bill is too radically wrong to permit of satisfactory amendment.

The very general character of the bill should attract attention: "That hereafter no persons shall perform on any living animal any experiment calculated to give pain to such animal, except subject to the restrictions hereinafter prescribed." Any living animal! That statement is sweeping; and our friends who proposed the bill could not have realized all it implies.

Section 2 deserves especially close attention, for it absolutely prohibits all experimentation in bacteriology; it practically compels the use of ether or chloroform in every hypodermic given to animals, and in the preparation of vaccine; by the provisions of this section experiments to test dogs for hydrophobia are also excluded.

But of all the faulty provisions, section 6 is the extreme par excellence. The Commissioners of the District are to appoint an agent of the Humane Society to inspect the laboratories; "special inspectors—who may be willing to act as such inspectors gratuitously," are also provided for. It is but natural that the most hysterical fanatics will make application for such appointment, and we would thus see the surgeons-general of the Army, Navy, and Marine-Hospital Service, as well as the chief of the Bureau of Animal Industry made subject to supervision by a local society composed of persons who are absolutely ignorant of the conditions governing the experiments upon which they would report.

Section 5, providing for reports of experiments to be made to the Commissioners, is equally harmful, and would lead to premature publication through the daily newspapers of half-finished results.

The press reports of the hearing before the Commissioners show that the vivisectionists condemned brutality as well as did the antivivisectionists, and all thinking men will agree with them in this. It has not yet been shown, however, that such brutality exists in this country, as the antivivisectionists would have us believe.

Washington is the best place in the country to fight this question out to the finish, for this bill, and any similar bill would seriously handicap the workings of the four sanitary departments of the National Government, i. e., the Marine-Hospital Service, the Bureau of Animal Industry, and the medical services of the Army and Navy, and any legislation which affects their work, more especially the work of the Bureau of Animal Industry, will also affect the State boards of health throughout the country; for at the present moment the Bureau is furnishing tuberculin and mallein to many of these boards. The present bill would result in stopping this supply of material now used in many States. The attention of the State boards is called to this point, and we urge them to immediately enter urgent protests against any legislation of this or of similar character.

Washington is perhaps the center of animal experimentation in this country at the present moment, and we can rely upon our scientists there to oppose this measure to the full extent of their influence, but as we would all be affected more or less directly by national legislation, it behooves the medical profession and the scientific world generally to move in this matter with promptness.

The legal question of making governmental departments subject to revision and inspection by the District Commissioners, or by volunteer inspectors of a local society of laity, is a point for careful consideration.

The following editorial in the American Medico-Surgical Bulletin for March 7, 1896, was also called forth by Senate bill 1552:

THE DEMAND OF SCIENCE—VIVISECTION.

Physicians and others interested in the progress of scientific medicine will do well to take note of the organized effort which is now being made in the District of Columbia and in the State of Massachusetts to secure the enactment of laws for the restriction of experiments upon the lower animals. It is scarcely necessary to call

attention to the fact that without such experiments there could be no scientific biology, and medicine would have no scientific basis. Our knowledge of physiology, of toxicology, and of the action of many important medicinal agents has been largely gained in this way. Our precise knowledge of the etiology of a considerable number of the infectious diseases has been obtained by inoculating susceptible animals with pure cultures of the various pathogenic bacteria, and could have been obtained in no other way. By such experiments the demonstration has been made of the specific pathogenic power of the anthrax bacillus, the spirillum of relapsing fever, the tubercle bacillus, the glanders bacillus, the diphtheria bacillus, the streptococcus of erysipelas and of puerperal fever, the micrococcus of pneumonia, etc.

The prevention of hydrophobia by Pasteur's method, the treatment of diphtheria by the antitoxin, the production of bovine vaccine virus, and other practical applications of the knowledge already obtained would be impossible if those who are urging antivivisection legislation could have their way. We can not stop to enumerate the various important practical benefits which surgery has derived from animal experimentation; but it is evident that the experience gained in this way as regards the comparative safety of different methods of ligating arteries, of closing wounds of the intestines, etc., has resulted in great improvements in surgical technique and in the saving of numerous valuable lives.

Yet, there are those who maintain that no valuable results have been attained by experiments upon the lower animals, and the antivivisection literature, together with much sensational nonsense, contains quotations from the writings of certain physicians which appear to support this view. No doubt these quotations, to a certain extent, are garbled, and in their proper connection would not give such positive testimony as to the ignorance of the physicians to whom they are credited. For, to deny the importance and value of the results which have been obtained by experiments upon the lower animals, is to give evidence of lamentable ignorance as regards the present position of the biological sciences, and especially of scientific medicine. But the argument that no results of importance have been attained, in view of the unimpeachable evidence to the contrary, is no longer given a very prominent place in antivivisection literature. This seeks rather to carry on the propaganda, which had its origin in England more than twenty years ago, by exaggerated accounts of the cruelty of the experiments performed; and the susceptibilities of many well-meaning and estimable members of the community have been aroused by the harrowing details of experiments which they are led to believe are frequently repeated in biological and pathological laboratories, but which few of those who devote their lives to research work in such laboratories have ever witnessed.

That physicians and others engaged in investigations having for their object the promotion of human knowledge and the prevention or mitigation of human suffering are less humane than the members of the societies which have been organized for the prevention of cruelty to animals can not be admitted for a moment. To pass laws subjecting them to penalties and to espionage by persons ignorant of the nature and objects of their experiments, as is proposed, would not only seriously hamper research work in all lines of biological investigation, but would be an uncalled-for reflection upon the humanity of those members of the medical profession and others who are engaged in investigations of this nature. As a matter of fact, anæsthetics are habitually administered in all experiments which involve an amount of pain worthy of consideration; but they are not considered necessary in trifling operations, such as the administration of a hypodermatic injection or the vaccination of a calf for the purpose of propagating vaccine virus.

It is difficult to understand why these mischievous attempts should be made to secure legislation the effect of which would be to restrict scientific investigation, when there is such a broad field in other directions in which the crusade might be carried on with greater propriety. The trapping of animals for their furs is going on in all parts of the world, and the victims are held for hours, or even days, in the sharp jaws of the trap before they are finally dispatched. The huntsman leaves his uncaptured wounded game to a lingering death. If he is a humane man, he quickly kills the wounded bird or animal when captured, and it has not been thought necessary to pass laws requiring him to do so. The fisherman plays the bass or salmon with a sharp hook in its mouth for an hour or more, and no one protests, but the teacher of biology is to be prevented by act of Congress from exhibiting the circulation of the blood in the blood vessels of the mesentary of a curarized frog. The farmer, by a cutting or crushing operation, castrates his colts, calves, sheep, and pigs, and capons are made by a painful cutting operation, but no one proposes legislation requiring the use of anæsthetics in the performance of these operations. Under these circumstances, it is not surprising that members of the medical profession in general resent the officious meddling of the antivivisectionists in matters regarding which they, as a rule, have no personal knowledge or responsibility.

To this may be added the following extract from the Journal of the American Medical Association reprinted in the Washington Post for February 10, 1896:

ANTIVIVISECTION BILL.

The deplorable ignorance of the lay public on the subject of vivisection was very forcibly shown at the hearing granted last week by the Commissioners of the District to those interested in Senate bill 1552, entitled "A bill for the further prevention of cruelty to animals in the District of Columbia." It was obvious that none of those who spoke in favor of its passage had the slightest conception of the subject under consideration, but it was apparent that sentiment and sympathy, born of impressions made by exaggerated antivivisection publications, actuated their misguided and deluded championship of the bill.

In the absence of knowledge of the subject, no one should chide these good-hearted men and women for the position they assume with respect to vivisection, and until those who are engaged in this branch of necessary scientific research explain to them how carefully, kindly, and accurately their work is performed, together with the incalculable benefit obtained in saving human life and preventing the ravage of diseases, will the oft revived "fad"—opposition to vivisection—crop up.

The General Government yearly makes large appropriations for the conduct of scientific prevention of diseases and death in man, beast, and vegetation, and the valuable work done, with the more valuable and far-reaching results consequently obtained by the Departments of Animal Industry, United States Marine-Hospital Service, Bureau of Medicine and Surgery, United States Army and United States Navy, and the laboratories of the different colleges and hospitals, are sufficient to prove that vivisection is necessary, and that any restriction of its practice will seriously impede scientific research and higher education.

Education of the masses, and particularly the misinformed opponents of this branch of research, and not acts of Congress, is what is necessary to silence objectors. The provisions and restrictions in the pending bill are sufficiently absurd and ridiculous to warrant its publication in full for criticism by the scientific world.

Prominent among those who were present with unanswerable argument against the passage of the bill were Drs. Samuel C. Busey, president of the medical society; Kleinschmidt, Magruder, Cook, Somers, and Woodward; Surgeon-General G. M. Sternberg, U. S. A.; J. J. Kinyoun, United States Marine-Hospital Service; Walter Reed, United States Army Medical Museum; D. E. Salmon, Chief of the Bureau of Animal Industry; Dr. de Schweinitz, of the bio-chemic laboratory; V. A. Moore, pathologist; Wardell Stiles, medico-zoologist; and Dr. Schroeder, director of experiment station, United States Department of Agriculture.

The bill will never become a law, for Congress will appreciate the impropriety of retarding medical research and scientific investigations by the supervision of uninformed laymen.

STATEMENT OF PRESIDENT OF THE MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA.

Dr. BUSEY. Gentlemen, I came here expecting to hear the subject of vivisection discussed, but I have been entertained with a long speech which has characterized the medical profession in general as brutes, as insensible of any sentiment or emotion of humanity, and as probably coming to the ultimate end of dissecting criminals and idiots alive. I believe that I am here in the interest of humanity, that broader and wider humanity, which includes all mankind. I am certainly here in the interest of that applied science which is the most beneficent of all sciences—medicine. I am not here to defend brutality or cruelty, but to tell you as plainly as I can what vivisection is, what it has accomplished, what it will continue to accomplish, the benefits that have been derived from it to mankind, the millions of lives it has saved, the suffering it has abated. I do not propose to analyze the bill that is before you. I simply want to call your attention to two provisions in it.

In answer to the first gentleman, who said it was simply to regulate cruelty, I refer you to section 2, line 11:

The animal must, during the whole of the experiment, be completely under the influence of ether or chloroform to prevent the animal feeling pain; and

(*d*) The animal must, if the pain is likely to continue after the effect of the anæsthetic has ceased, or if any serious injury has been inflicted on the animal, be killed before it recovers from the influence of the anæsthetic which has been administered.

While it is claimed that this bill is to regulate and to restrain vivisection, those two clauses mean that it shall be positively prohibited.

Mr. KENNEDY. Unless subjected to anæsthetics.

Dr. BUSEY. I mean what I say. That those two clauses mean the absolute prohibition of vivisection. It may be that in many instances the animal could be destroyed without interfering with the experiment, but in a large number of instances the experiment would be cruelty unless the animal was restored to life, because it is only in the after effects of the experiment that any advantage is to be seen or derived. Then again, section 6 prescribes that there shall be appointed inspectors, authorized agents of the Washington Humane Society, to make such inspections, and may also appoint such special inspectors as they may think fit, either permanently or temporarily, who may be willing to act as such inspectors gratuitously.

This is authority to appoint inspectors, not because they have any knowledge of the thing itself, but because they are enthused by some emotion or sentiment to determine upon the propriety, the expediency, the cruelty, or the humanity of a series of investigations, and that is to be voluntary and gratuitous service.

Thus, taking those two sections in the bill, it is as exclusive and as prohibitory and just such a measure as one of the speakers said if he had his own way he would carry into effect. So that while the bill undertakes to restrain and to grant privileges to scientific investigation, it is so drawn, and so shrewdly drawn, that in its operation it will be absolutely effective in arresting, restraining, abolishing all investigations of the sort.

Now, the point, so far as I can see it, is that those who have spoken do not really know what vivisection is.

Late in the autumn of 1895 the members of the Congress of American Physicians and Surgeons, deeming this a matter of grave importance, determined to appoint a committee of the very best medical men in this country to lay this matter fairly before the public. I have a list of that committee here, composed of men who are above reproach in any way whatsoever, who, if they are not members of the Humane Society, belong to a humane profession, and have accomplished much valuable work in their profession in the various parts of this country, thus saving many millions of lives. I will read the names, as they are men of distinguished reputation and have accomplished valuable scientific work—far more than those whose names have been mentioned here and urged with so much force as being antivivisectors. They are as follows:

(Here Dr. Busey read the list of members of the Joint Commission on Vivisection, given above in "Vivisection: A Statement in Behalf of Science.")

Now, Mr. President, to continue. Let me call your attention further to some more important benefits, to show you why biologists and medical men should not be denied the right of scientific research. That is all that we claim, and that for humanity. Medical investigation can not be limited to the ordinary conditions of human life. Medicine did not advance, and has not advanced, except through animal experimentation. All the great advances that have contributed so much to health, to society, and to life, have found their origin in the results deduced from vivisection or animal experimentation. It is true that many times experiments have been performed without any immediate practical result, but the results were recorded, and men in after years, sometimes a century afterwards, have availed themselves of those same

experiments, perhaps repeated them, and reaffirmed them, and applied them to practical medicine, with the most satisfactory results. Clinical observations and experience would be hopelessly fallacious but for the evidence which the vivisectionists have brought to our knowledge. Then I may lay down these propositions, first, that animal experimentation has determined the functions and normal relations of the organs composing the animal economy, which could not have been determined in any other way except by experimentation upon living animals. Again, animal experimentation has determined the causes of those perversions of function presented in conditions designated diseases. We could not have been able at any time to have determined what disease was, or to have distinguished diseases, or to have followed them from their initial causes without such experiments.

Again, experiment has determined the nature of morbid process and the relation of their causes to consequent systemic actions. That is equally plain, and thus is made up the whole system of clinical medicine which includes the knowledge of the nature of diseases and knowledge of the symptoms and the cause of the diseases, and the knowledge of the agencies with which we are to combat these diseases. Without this we would be utterly powerless to treat any disease. We might be even worse, utterly powerless to recognize the difference between diseases. Simply take that disease, now so prevalent here, typhoid fever. Less than a hundred years ago, not further back than 1830, it was confounded with typhus fever, which we now know, through experimentation, is a very different and more curable disease. In fact, our whole knowledge of typhoid fever, as to its cause, how to eradicate it, and how to cure it, is due to animal experimentation. Then to proceed, Galen demonstrated that arteries contained blood. He demonstrated the movements of respiration; he demonstrated the movements of the bowels by experiments upon living animals. Harvey discovered the circulation by vivisections. Galvani, as I have called your attention before, discovered the application of electricity to nervous diseases. Certainly no more important discovery has occurred at any time than that one discovery of Galvani, and no more satisfactory results, which have brought wealth and fortune and comfort to the world, have ever been made than that one single experiment by Galvani.

Hook, by vivisection, discovered and demonstrated artificial respiration, which enables us to-day to restore the asphyxiated, which has saved many stillborn children, which has saved many from drowning, which has saved persons every day from asphyxiated conditions.

Boyle discovered that atmospheric air—by vivisection, I want you to understand—was necessary to maintain life.

Priestley discovered, by vivisection, that oxygen was absorbed from the air, and that the carbon dioxide was exhaled in the expired air. I need not stop to tell you of the importance such results have been. Wren discovered transfusion—that process by which we can convey blood from the living animal into sick persons and keep them alive, resuscitating them. This discovery has saved an innumerable number of child-bearing women from death, when every drop of blood had nearly run out of their bodies. Haller and others, by vivisections, discovered the difference between the sensory and the motile nerves; that all motion in the human body proceeds from the brain and its annexed cerebellum and spinal marrow. He thus laid down the foundation for further researches which have led us so far, indeed, that we can now distinguish the diseases in different parts of the nervous system and treat them with great success.

Magendie followed these experiments with others; and then came Claude Bernard, who determined the precise relations of certain drugs to certain functions, through experiments on living animals. He emancipated medicine from empiricism and placed it upon a purely scientific physiological basis. Marshall Hall followed this very soon afterwards with the discovery of the reflex action of the spinal cord, and John Hunter demonstrated how arteries were repaired when ligated, and thus affording the opportunity to us to save life by ligating arteries in diseases wherein before they were unavoidably fatal.

And then followed the discovery by Ollier of the power of the periosteum to reproduce bone, by showing that if the periosteum is left bone might be reproduced. Then came Simpson with the discovery of chloroform, which has mitigated suffering, which has saved pain, which has prolonged life, which has saved millions of lives. It was the result of vivisection. And then followed vivisections which brought to us the method of administration of medicine by the hypodermatic method. Ambroise Paré demonstrated the application of the ligature to arrest hemorrhage.

I could not tell you what have been the benefits of these discoveries to the human race, how much they have added to life, how much they have added to happiness, how many millions have been saved to mankind, and the value of the experiments within the past two decades upon living animals, which have enabled us to locate the functions of the brain—to locate them so accurately that we can trace diseases in other parts of the body to the precise locality of the brain—which has opened a new and promising field to surgery, by which people who formerly died, or who were left worse perhaps than dead, living simply as animals, have been restored to such life that they are again useful, and is leading up to the point that we may be enabled to save the lives of that vast number of people who are suddenly stricken with apoplexy.

I have now reached the period when bacteriology began. I shall not say much, but leave it to General Sternberg, who will follow me. I want to call your attention to a few of the ordinary relations of cells to disease and to life. To animal experimentations we are indebted for the discoveries in cellular pathology by Virchow. Villemin studied the causes of tuberculosis, and Pasteur has filled the world with amazement by the brilliancy of his investigations, which have not only contributed to the wealth of France, but to the saving of millions of human lives.

Following his investigation came Lister, who has made surgery so safe that there is little or no harm in it, and who has brought into the field of the surgical knife organs and parts of the body beyond the conception of man's brain. There was no man living before Lister who had the courage to enter the cavities which we do now with almost absolute safety. These results were obtained by vivisection upon living animals. Then followed Koch, whose name is familiar to you all, who still lives, as does Lister, and is still pursuing his work at Berlin. He discovered the bacilli of tuberculosis and cholera and taught us how to diagnose tuberculosis long before it has reached the period when death is inevitable. So followed others, Behring more recently.

Preventive medicine is indebted exclusively and solely to the results which vivisection has taught us. To-day we would not be able to tell you how to prevent the contagious diseases that visit us at periods, how to cure them, how to limit their prevalence, how to save the life of the young, which is more important, perhaps, than saving it among the old.

Let me, before I close, tell you one instance in this city where the results of vivisection have been brought directly home to us.

Perhaps a year ago a lady with a pet dog was bitten on one of her fingers. So far as she knew, the dog was well. She suffered nothing from it, but some of her friends suspected the dog might be rabid, so the dog was killed and buried, and then some other friends still urged that there might be danger, and a physician was called. She had no symptoms of disease—hydrophobia has no definitely distinct clinical picture until the last symptoms come. One is never able to detect it in the initial conditions unless he can connect the wound with a rabid dog. In this instance there was no evidence of the rabid dog, nor evidence that the young lady was affected; nevertheless, friends insisted that she should be sent, with the doctor's consent, to Pasteur's institute in New York, the hydrophobic institute. In the meantime the doctor in charge resurrected the dog and took from him poison which was injected into guinea pigs by vivisection. In the course of some days, a week or ten days, this young lady still being at the hospital, these pigs became rabid. It was immediately telegraphed to that hospital that the result of those experiments had proven that the dog was rabid just in time for them to commence effective treatment that saved her, and the physician in the hospital sat with her that whole night to save her life from that disease. That is one instance. Is not that one life worth all the dogs that ramble and crowd this city's streets? But that is not all.

Another instance in this same city where a dog, a pet dog, a favorite dog, a dog belonging to a family of four children and father and mother, became so affectionate that it attracted the attention of the father, and he called the attention of his doctor to the fact that this dog had recently become so affectionate; he wanted to be fondled all the time, and kissed and licked them. The doctor said, "Send that dog away." That dog was tested whether he was rabid or not. He was found to be rabid and killed. Thus were saved four children and perhaps father and mother from hydrophobia by vivisection that was performed upon guinea pigs. And then I might tell you of another, but more lamentable, instance where a lady was bitten, and where the vivisections were not done until too late, and she lost her life from hydrophobia. All these instances have come to us within a year past in this city.

I will now close by reading a single paragraph by the late lamented Dr. Loomis, of New York, speaking on this same subject:

> In this defense of animal experimentation results have not been made prominent with any purpose to conceal method. We are fully prepared to count the cost and to meet the question, "Does the end justify the means?" As devotees to medical science we yield precedence to none in honesty and loftiness of purpose, or faithfulness of service in the bitter conflict humanity ever has waged and ever must wage against pain and disease. We, too, have hearts that love and pity, that ache and sometimes even break beneath the loads they bear. We glory in our experimental work because we know the tenderness of cruelty, the balm of pain; the life whose birth is only in the throes of death. Must, then, our conflict cease; our weapons be laid aside because selfish ambition has now and then made fiends of men? Since philosophers first learned to trace "with their golden pen on the deathless page" heroic deeds of men, humanity has never failed to offer its first homage to those who gave their lives for others. As the servants of such a science we can fearlessly appeal to all intelligent men for a just criticism. From the ignorant we expect to receive only censure, but from those who "in the valley of the shadow of death" have learned to know what manner of men we are, I have faith to believe the reply will come: "We have trusted you with the lives of our loved ones; we intrust to you God's dumb creation."

Dr. STILES. The following letter by Dr. Daniel E. Salmon, Chief of the Bureau of Animal Industry, United States Department of Agriculture, was printed in The Washington Post of February 4, 1896, and

refers directly to Senate bill 1552 and to the address by Mr. R. Ross Perry, delivered before the District Commissioners and afterwards circulated in pamphlet form. (See p. 5 et seq.)

DR. DANIEL E. SALMON'S LETTER.

EDITOR POST: It is with much surprise that I read the editorial in Sunday's Post (February 2) with the caption, "A defense of vivisection." I presume it was called out by the agitation now in progress in this city, which has for its object the suppression of experimentation upon living animals. It is a subject which certain members of the so-called Humane Society have had under consideration for several years, and they now come before Congress with a bill, deliberately drafted, which apparently has the sanction of the National Society, and which, while pretending to regulate experimentation, is really intended to suppress it.

We had a right to suppose that a society which prates so loudly about altruism, morality, and ethical principles generally, would see to it that they could not be charged with misrepresentation or deception when asking for legislation so important and so far-reaching in its results. Although it was at first stated that the whole object was to secure only proper restrictions on experiments, there was no serious attempt, at the hearing before the District Commissioners, to deny the charge that their deliberately planned bill would absolutely prevent any useful experiments being made. The bill is so radical, so uncalled for, so monstrous in its provisions, that there was no defense of it attempted. Each speaker, including Mr. Perry, the eloquent attorney who appeared for the bill, contented himself by saying, "This is not my bill," "I am not here to defend this particular bill," "This bill is not as I would have drawn it," etc.

The arguments in favor of this bill consisted of glittering generalities on the wickedness of torturing dumb animals for mere curiosity, on our duty to protect these helpless creatures from suffering, and on the effect upon the vivisector, and through him upon society, in causing insensibility to suffering, immorality, and viciousness.

AS TO SHAKESPEAREAN AUTHORITY.

The latter point Mr. Perry proved to his satisfaction by a quotation from Shakespeare, whom he likened to a God in his knowledge and perception of all subjects which received his attention. As a scientific man I object to the proposition to modify my opinions on scientific questions at the beginning of the twentieth century and to make them accord with the writings of a dramatist of the sixteenth century, as interpreted by a member of the legal profession in the height of a great forensic effort. And as a believer in morality I should hesitate to accept indiscriminate quotations from Shakespeare as a guide for modern life and principles.

The way to decide whether vivisection has this effect upon vivisectors is to investigate the vivisectors and determine whether as a class they are brutal, vicious, degraded, and whether they exert a pernicious influence upon society. I happen to know personally the principal vivisectors of the United States and some of those of the European countries, and I deny emphatically, and without any mental reservation whatever, that vivisection by the scientist has any such effect.

Whether it would have that effect in case the assumptions of the humane society and the writer of the Post editorial were correct, that it is simply torture carried on by hard-hearted men to gratify their curiosity and to furnish them diversion, I shall not stop to inquire. These assumptions, so far as they apply to vivisection in the District of Columbia, are false and a cruel slander upon the modest, patient, self-sacrificing, persistent scientists who are giving their days and their nights, their lives, their everything to the cause of true humanity in seeking the cause and the cure of the many terrible maladies which afflict both man and the lower animals, causing untold and inexpressible wretchedness, pain, and suffering. Is it proposed to blacken the reputation of these men and put upon them the stigma of brutality and cruelty on the demand of a few people who practically know nothing of the subject and whose enthusiasm and fanaticism are due principally to having regaled themselves for months upon the horrible and blood-curdling stories prepared or sent out by the English Antivivisection Society?

WHAT IS ITS TENDENCY?

Are we to accept these biased statements of alleged cruelties, conducted in other parts of the world, many of them before the days of anæsthetics, when there is no opportunity to hear the reply of the men whose reputations are impugned? Above all, are these assertions to be applied to our own scientists in Washington, whom we know and esteem, and is their work to be stopped without a careful inquiry as to whether such action would be really in the cause of humanity and civilization, or

whether it might not tend toward ignorance and the maintenance of suffering? In the name of science, and speaking for the investigators of the present day in this city, I protest with all the emphasis and indignation of which I am capable against the assumption that they are cruel, that they torture the animals upon which they experiment, or that they are guilty of the needless infliction of pain.

They are cruel in the eyes of supersensitive and hysterical persons because their experiments necessarily cause pain; but, as was admitted by Dr. Leffingwell, the principal witness brought in favor of the bill, pain is an incident to this life, and there are occasions where its infliction is justifiable. To hold otherwise would be for legislators to revolutionize society as at present constituted and put in jeopardy the existence of the human race. We inflict the most terrible pain upon animals by certain operations universally practiced for economic reasons, and we ship millions of animals every year long distances by rail and boat, where they are crowded, bruised, maimed, exposed to hunger and thirst, and finally slaughtered by a painful process. This is done in order to supply food for the support of human life. The scientist makes experiments upon a comparatively few animals, causing no greater pain, and he does this to obtain the knowledge and the means of saving human life, and animal life as well. In this the scientist has a better defense than society at large, because we could obtain food from the plants of the field and the vegetables of the garden, but there is no other means under heaven yet revealed to man by which disease can be investigated and the cures of disease discovered and prepared but by experiments and operations upon animals.

THE LINE MUST BE DRAWN.

Mr. Ross Perry, in his eloquent appeal for legislation, some legislation, any legislation, spoke of the sacredness of life in general, and with menacing tones and finger of scorn he warned those who would take this life of the terrible nature of their offense. Unfortunately for the clear perception of those who listened, he failed to make any distinction between the life of a man and the life of a dog, or between the life of the dog and the life of the flea which torments the dog. It must be evident to all thinking persons that a line must be drawn somewhere or the food of man, and even man himself, would be devoured by this inferior life, the exuberant multiplication of which he finds it necessary to repress on every side and by every means at his command.

And who is best fitted to draw this line, the scientist who makes a life study of this branch of knowledge, or the well-meaning ladies of the Humane Society, whose overwrought imaginations picture to them cruelty and torture where none exists?

If any life is sacred it is the life of man, and true humanity consists in guarding the bodies of men and women from disease and suffering, even, if need be, at the expense of the lower creatures. These self-styled humanitarians have, however, forgotten the suffering and anguish and grief of mankind in their frantic efforts to protect the dog, the cat, the mouse, etc., from the vaccinating lancet and the hypodermic needle of the vivisector. According to them there is no defense for the man who saves a child at the expense of a rabbit, or for him who by experiments upon animals brings out a reliable and certain preventive for so mysterious and fatal a disease as was hydrophobia but a few years ago, and thus saves thousands of human lives. So desperate have they become in their efforts to discredit the discoveries made by experiments upon animals that they deny the existence of such a disease as hydrophobia; they deny the value of tuberculin; they deny the curative effects of the antitoxine in diphtheria and tetanus; they deny the utility of the discovery that tuberculosis is a contagious disease which is caused by a living germ; they are even prepared to make the sweeping denial that any good has come from all the progress in bacteriological knowledge during the last twenty years.

VIVISECTION THE ONLY HOPE.

How can legislators and health boards and society at large deny these things? How can tuberculosis be eradicated from dairy herds except by testing with tuberculin? How can glanders be eradicated except by the use of mallein for diagnosis? How can the mortality from diphtheria be kept at a minimum except by the use of antitoxin? How can we determine in time for treatment whether the dog which bites a child or an adult is rabid except by inoculating a rabbit or other animal? How can we prepare the material to treat those who are thus bitten except by producing the disease in rabbits? What hope is there outside of vivisection that any relief will ever be discovered for the 150,000 people who annually suffer and die in this country of consumption and other forms of tuberculosis, and for the thousands who are victims of other bacterial diseases? What hope for the millions of animals, horses, cattle, sheep, and swine, which now suffer and die from the contagious diseases of animals?

If the Humane Society has its way, all investigations and all work of this character

will be stopped. It will be impossible to prepare the material for preventing hydrophobia in persons known to have been bitten by rabid dogs; it will be impossible to prepare antitoxin for the cure of diphtheria or any other disease; it will be impossible to even prepare animal vaccine for guarding against smallpox; we can no longer use tuberculin for testing dairy cows for tuberculosis, nor make the one reliable test which is necessary to determine if a dog has hydrophobia.

Such legislation would indicate that our regard for the brute was superior to our love for mankind; it would be placing the claims of the horse, the dog, the guinea pig, the mouse, even, above those of the child; it would be an outrage on suffering humanity in this country, and a stumbling-block to the cause of science the world over.

PUBLIC SENTIMENT IN THE MATTER.

I can not believe after Congress has encouraged the development of science and research in this city to an extent which compares favorably with what is seen in the most advanced nations of the world, that it will now call a halt and turn the hand of progress backward on the dial to the point it left a quarter century ago. The great mass of the people of Washington must certainly be too enlightened and by far too intelligent to allow such arguments as have been made, based as they are upon weak philosophy and a false idea of what constitutes humanity, to influence them in asking for such action.

It is a good time to remember that the person who cries "stop thief" the loudest is not always the most honest man in the crowd, and in like manner the persons who proclaim their humanity, their superior sensibilities, their intense morality from the housetops may be no more phenomenal in these respects than others who are more modest and less demonstrative.

The Post says that "society can well afford to dispense with the cutting up of live animals before the pupils of the public schools." As the Post has the facilities for obtaining information on this subject, will it please inform its readers if live animals are now, or ever have been, cut up before the pupils of the public schools of Washington? If so, will it kindly state exactly how these exhibitions were conducted, who was responsible for them, and whether the District authorities could or could not prevent them without additional legislation? The scientific men of this city are not clamoring for such exhibitions, nor would they countenance anything of the kind which involved cruelty or torture. Such exhibitions, moreover, are demonstrations, not experiments. They are designed to illustrate facts which are already well known—not to discover any truth or principle. They may be abolished in the public schools, if they are practiced there, without any direct injury to scientific research or humanity, and without further legislation.

The prohibition of demonstrations in the public schools is apparently but an insignificant part of the programme of the people who are now asking for legislation. Nothing but the complete destruction of scientific research in this field of knowledge accords with their present frame of mind, and this they will never accomplish if the conservative element in society gives the subject the attention which its importance demands.

D. E. SALMON.

II. In the next place, I desire to draw to your attention the fact that the list of physicians which the Illinois Antivivisection Society has published under the heading "The courage of conviction," and which has probably been brought to your attention, should be taken cum grano salis, and a clear distinction should be drawn between two classes of signatures. The name of Dr. Charles F. Dawson, of Washington, D. C., appears on that list, and I desire to submit the following letter showing that his name is used without his knowledge or consent:

WASHINGTON, D. C., *February 9, 1896.*

DEAR DOCTOR: In reference to the matter to which you called my attention, i. e., the use of my name by the Illinois Antivivisection Society in the list of physicians over which the expression "The courage of conviction" is printed (p. 9, Summary of Work from June, 1894, to June, 1895, printed at Aurora, Ill., 1895), I desire to state that my name has been used without my knowledge or consent.

You have undoubtedly already noticed that two different classes of signatures are included in this list, as is shown by the two paragraphs at the top of the page, which read as follows:

"We give below the names of physicians who put their names on the antivivisection registry list at our World's Fair antivivisection exhibit, and those who have since signed the petition for the total abolition of vivisection.

"It must be borne in mind that we can only reach a comparatively small number of the sum total of physicians in the United States. Considering this fact, we feel that we are doing well among the profession."

I signed the registry list at the World's Fair under the impression that it was merely a visitors' list, such as was to be found at many other exhibits at the fair. By signing the visitors' list I expected that the Antivivisection Society would send me its literature, and this it has done at odd intervals.

I wish to state most emphatically, and without any mental reservation whatever, that I never intended that my name should be used by the society as being opposed to vivisection as practiced by scientific men to-day. I am, of course, opposed to wanton cruelty of all kinds to animals, instances of which we see daily practiced on the street, but after years of experience in two of the most important laboratories of this country I am thoroughly of the conviction that the vivisection practiced by scientists is perfectly justified.

In conclusion, I would state that the publication of the list above referred to, of physicians who have the "courage of conviction," including two entirely distinct sets of signatures, in order to increase the apparent, though not real, support of the antivivisection movement, seems to me an excellent illustration of the tactics now followed by the antivivisectionists.

Assuring you of my most hearty cooperation in opposing the present uncalled-for agitation known as the "antivivisection movement," now supported by persons whose good intentions exceed their information on the question at issue, I remain,

Very truly, yours,

CHARLES F. DAWSON, M. D.

Dr. CH. WARDELL STILES,
Washington, D. C.

III. There are a number of extremely objectionable points both in the original bill and in the proposed substitute bill which has to-day been submitted to the committee. It seems almost unnecessary to discuss further the original bill, which, by its provisions, would not only prohibit medical investigations, but which would prevent the practical application of discoveries already made; a bill which would absolutely prohibit the investigations in economic entomology looking to the destruction of insect pests, which are responsible for so much damage to the agricultural interests of the country; a bill so radical in its nature, so deceptive in its wording, that it is only calculated to bring law into contempt. My remarks will therefore be confined to the substitute bill.

Section 1: In the substitute bill the word "vertebrate" has been inserted. The term vertebrate includes both cold-blooded animals (fish, amphibia (frogs), and reptiles (snakes, turtles, etc.), and warm-blooded animals (birds and mammals), and its use here is totally unjustified from a scientific standpoint. It is absurd to place the cold-blooded animals, in which we find a lowly organized nervous system, with the warm-blooded animals in one category so far as pain is concerned. Many of the experiments which scientists perform upon the cold-blooded animals are no worse than the cold-blooded animals perform upon themselves. To take a familiar example: If a scientist were to capture a certain lizard, known to biologists under the name *Anguis fragilis* and to deliberately break the body in two, the antivivisectionists would denounce this as an act of brutality; to name such an experiment as brutal would, however, be ridiculous, for this animal possesses the faculty of breaking itself in two, and frequently does so. For instance, if this animal is caught by the tail, it will calmly leave its tail in the possession of its captor and crawl off.

Furthermore, the experiments performed by vivisectors upon fish, amphibia, and reptiles are no more cruel than the daily practices of fishermen. If the scientists are to be deprived of these animals in experiments, then it would be only consistent to pass a law that fishermen should be compelled to kill the fish immediately after taking them out of the water, to forbid the use of living frogs as bait, to forbid the placing of live lobsters in boiling water in preparing them for the table, etc.

The legislation here proposed is a class legislation, against science, exempting sport.

Section 2*a*: "The experiment must be performed with a view to the advancement by a new discovery of physiological knowledge or of knowledge which will be useful for saving or prolonging life or alleviating suffering."

There are several very unjust provisions in this section.

First. The words "by a new discovery" exclude the confirmation by scientists in this District of discoveries, or alleged discoveries, made at different times, in different places by various workers. If a discovery has been made and published by a German or a Frenchman, it should be confirmed by other investigators in other countries under other environments, and legislation against such thorough confirmation of actual or alleged discoveries would leave us in the dark on many questions, or compel us to accept published accounts which we might not consider sufficiently established. Furthermore, occasion might easily arise where it would be advisable to repeat an experiment made elsewhere, not so much for the purpose of confirming the result itself, but for the purpose of our own personal instruction, in order to watch all the stages of the experiment. The repetition of this experiment might have an influence in determining the course to be pursued in some other experiment we had under advisement, and to legislate against such repetition would handicap us in our work.

Secondly, the term "physiological" in this section is altogether too narrow and does not cover the cases of experimentation. If the section stands at all, the broader term "biological" should be substituted.

Thirdly, in connection with the last half of the paragraph it should be noticed that the tendency of this expression, "of knowledge which will be useful for saving or prolonging life or alleviating suffering," is not in accord with the history of scientific progress, for it assumes that abstract science can be divorced from applied science.

This is utterly impossible and inadvisable, and in support of this statement I would respectfully refer to the "Statement in behalf of science," given above, also to the discoveries given in Dr. Loomis's address under the first class (see p. 63), and would add the following illustration to show that we do not know what moment a point established as what some people refer to as "mere scientific curiosity" may in an unexpected manner and at an unexpected time suddenly be found to be of the greatest practical value:

The history of trichinosis.—In 1835 Prof. Richard Owen, of London, described a minute worm, under the name *Trichina spiralis*, which had been found in a human cadaver. It was afterwards found by various other persons, and in 1847 the same worm was found in American hogs by Professor Leidy, of Philadelphia. The medical and scientific fraternities of the world, however, looked upon this worm as a mere zoological curiosity rather than as the cause of a serious disease, and no one ever suspected that it would one day play an important rôle in the commerce between America and certain European countries. In 1850 Herbst discovered that this worm is transmissible from one animal to another when a mammal infested by the parasite is eaten by another mammal. Still the worm and its life history were "matters of zoological curiosity" (abstract science). Not until 1860 was it known that this parasite was the cause of a disease which physicians had up to that time confounded with typhoid fever, but which Professor Zenker, of Leipzig, showed to be distinct. But no sooner had Zenker discovered the etiology of the disease than he was able to see the source of infec-

tion, for his patient had eaten pork, and the discoveries ("mere matters of zoological curiosity") of Leidy and Herbst became matters of great importance (applied science), discoveries afterwards confirmed by numerous other authors (Virchow, Leuckart, and others).

Other similar examples could be cited. The scientist is forced to support the view that abstract science can not be divorced from applied science, and to protest against any legislation which, like the last half of section 2*a*, tends to separate the two.

Section 2*b*, together with section 4, is most unjust; for while section 2*b* authorizes medical officers of the Government to perform experiments, it does not accord the same liberty to scientific men who are not medical officers, and section 4 expressly excludes students, candidates, and graduates in science and philosophy under 25 years of age (unless they are graduates in medicine), while it permits a doctor of medicine and evidently also the doctor of veterinary medicine under 25 years of age to experiment upon animals.

In the name of zoologists, I enter a most urgent protest against the passage of these sections, which are based upon a total ignorance of the value and meaning of the doctor's degree, the training which men in different lines of scientific work undergo, and the class of men engaged in animal experimentation.

In the first place, in the vast majority of universities of this country, the man who takes a degree as doctor of science or doctor of philosophy has been obliged to do original investigation in order to obtain his degree, while this is not the case with the degree of doctor of medicine. Other things being equal, therefore, the doctor of science or the doctor of philosophy upon receiving his degree is better trained for the purpose of carrying on animal experimentation than is the doctor of medicine or doctor of veterinary medicine, and there is no justice in preventing the former from using animal experimentation in his work.

Again, in the laboratories of the Bureau of Animal Industry, United States Department of Agriculture, we have at the present moment, or have had within the past few years, eight men employed as chemists, histologists, zoologists, etc., who were not graduates in medicine, but who are frequently obliged to use animal experimentation in their work. The clauses cited would prevent certain of these men from carrying out their official duties, no matter how competent they might be in their particular branch of work.

Secondly. The candidate for the degree of doctor of science or doctor of philosophy must present an original thesis on his major subject before he can receive his degree. If he takes this degree with physiology or biology as major subject, the proposed legislation, in case the candidate is under 25 years of age, would exclude his using animal experimentation in the preparation of his thesis, and this would result either in rendering many theses in these branches of little or no value, or in greatly limiting the number of subjects from which the candidates might choose. The legislation would also exclude advanced undergraduate work in which animal experimentation is used—a most unjust provision, since this preliminary training is most valuable to men who intend later to enter scientific work, and since many valuable discoveries have been made by students and candidates in the preparation of their theses.

Section 2*c* excludes some valuable and necessary experiments in which the use of anæsthetics is out of the question. Fortunately, the number of such experiments is exceedingly limited; but, though limited in number, they are none the less necessary or valuable. This section might also be interpreted to exclude experiments upon lower animals

when the subject has been "pithed," although this operation would render it as insensible to pain as anæsthetics would do.

It is as senseless to pass a law compelling men to administer anæsthetics in experiments as it would be to pass a law compelling a surgeon to give anæsthetics in a surgical operation. Cases arise in both fields where it is impossible to use anæsthetics—fortunately, only exceptionally. Furthermore, not only would and does the common sense of humanity lead a worker to give anæsthetics whenever possible, but their administration is in the vast majority of cases more conducive to the quiet, ease, and success of the experiment.

The clause "nor in tests of surgical procedure need animals be kept completely anæsthetized during the process of recovery" leaves a loophole by which our well-intending and uninitiated friends supporting this bill might seriously interfere with our work. The question of the use of anæsthetics should, in experiments as in surgical operations in hospitals, be left entirely to the judgment of the operator.

No doubt the early experiments performed without anæsthetics and possibly a few later experiments performed in foreign countries will be brought to your attention in support of this clause. I would respectfully submit that evidence of this kind is of no more value in support of this bill than would the atrocities in Armenia or during the Spanish Inquisition be valid arguments in support of a bill to regulate the religious services of churches in the District of Columbia. I submit that it will be ample time to legislate upon this subject when our well-intending but misled friends, who are unconsciously placing themselves on record as opposed to advance in medicine, succeed in showing that abuses in this line exist in the District of Columbia—in other words, when they show some cause for legislation.

The legislation proposed is an insinuation by the supporters of the bill that the persons who give up their lives to research work in biological lines, often running great personal danger, are less humane in feelings than are those persons who, though not acquainted with the details of our work, are desirous of placing restrictions upon us. And the so-called "antivivisection literature" fully warrants the assertion that this insinuation often rises to a declaration.

As a practical experimenter of considerable experience in this line for one of my age, with an intimate personal acquaintance with many vivisectors of Europe and America, I am firmly of the conviction that the training and experience of investigators render them even more sensitive to the sufferings of other people and other animals than are our friends who oppose us. There is, however, this great difference between them and us: We look beyond the suffering of a few dozen, a few hundred, or a few thousand rabbits, dogs, cats, rats, etc., and see the sufferings of thousands upon thousands of human beings of the present and future generations.

In all my experience in the laboratories of Pasteur, Koch, Schulze, and Leuckart in Europe, or in the laboratories of the Bureau of Animal Industry of this city, or in my visits to other laboratories of this country, or in my personal associations with vivisectors of no less than nine different nationalities, I have never heard sentiments which could compare in brutality and narrowness with those expressed in a hearing upon this bill before the District Commissioners by one of its most ardent supporters, i. e., to the effect that all they demand is that the experimenters shall submit to the same fate as the animal upon which they experiment.

Section 2d is uncalled for. Its provisions are always carried out, and

it is as useless to make this a law as it is to declare that a hunter should kill the game he shoots. The points covered in this section can be fairly left to the ordinary feeling of humanity in the experimenters.

Section 2e: If there were any call for the legislation proposed in this section, the section would be supported by scientific men. Regarding the point at issue I submit the following letters by Professor Powell and Mr. Hay:

OFFICE OF SUPERINTENDENT OF PUBLIC SCHOOLS, FRANKLIN SCHOOL,
Washington, D. C., April 24, 1896.

DEAR SIR: In answer to your favor of the 16th instant, I beg to say as follows:

First. Vivisection does not take place in any form in any of the public schools of the District of Columbia by authority.

Second. Vivisection has never been practiced in the schools of the District of Columbia, so far as I have been able to ascertain after the most diligent inquiry.

Third. No legislation is necessary on this subject, because the authorities of the schools are radically opposed to vivisection except by experts for scientific purposes, and will do everything in their power without legislation to prevent its occurrence in the public schools.

I suspect that if it has been thought by anyone that vivisection is practiced, the impression has come from the fact that much dissection is practiced in the teaching of physiology, as our method of teaching is objective whenever it can be made so. Every school, therefore, draws heavily upon the neighboring markets for specimens of eyes, lungs, brains, joints, sections of bone and muscle, etc.

I am yours, very respectfully,

W. B. POWELL, *Superintendent.*

DR. CH. WARDELL STILES.

ZOOLOGICAL LABORATORY, CENTRAL HIGH SCHOOL,
Washington, D. C., February 24, 1896.

DEAR SIR: In reply to your inquiry of recent date regarding the practice of vivisection before the classes in my department at the Central High School, I can state positively that nothing of the sort has ever occurred.

The animals studied in the first-year classes are brought to the laboratory in the living state when practicable, and are so studied. When it is found necessary to kill them, chloroform, chloral, or alcohol is used, and the class receives the animals dead. So far as I can now remember the death struggles have never been witnessed by a class.

The list of animals which are dissected is as follows: Earthworm, crayfish, insect, clam, and fish. The class very rarely has time to study the warm-blooded animals. The birds, however, are well represented in our collection by skins and skeletons, and it is from these the work is completed.

In the fourth-year class of candidates for the Normal School more thorough work is done, and in addition to the above-mentioned types the frog is usually dissected, and sometimes also the pigeon.

For work with both these animals complete insensibility is secured by the thorough use of chloroform, or, in the case of the frog, by pithing. It is unnecessary to add that from either of these methods there has never been a case of resuscitation during the dissection.

The only instances of the dissection of a mammal which I have any remembrance of are as follows: Two years ago a cat was killed for the purpose of obtaining the skeleton, and advantage was taken of the procedure to show to those in the room the different organs of the cat in their natural position. Three or four boys were the only spectators, until near the end of the demonstration two or three of the girls came into the room and looked on. It was after school hours, and was not done for the benefit of any class.

The second instance was during the session of 1894–95. To show to a class of boys who were doing special work in zoology the distinguishing characteristics of the didelphia and monodelphia, I dissected before them a freshly killed opossum and a cat. Both animals were as dead as chloroform could make them, and only these boys saw the dissection.

Hoping these facts may be of value to you in defeating the antivivisection bill,

I am, very truly,

W. P. HAY.

DR. C. W. STILES.

First. I desire to direct attention to the point that "medical schools, hospitals, and colleges" are here included in the expression "public schools." Many people, including vivisectors, have expressed themselves "against vivisection in the public schools," but I submit that the expression "public schools" does not include "medical schools, hospitals, or colleges," and any such petitions which may have been presented to the committee should not be considered as referring to higher institutions of learning. The Humane Society has failed to show any necessity for legislation governing the "medical schools, hospitals, or colleges."

The Humane Society has failed to show the necessity for legislation upon this subject.

Second. This is a point which should be left entirely to the investigators; I fear legislation of this kind might seriously impede men in some important experiments. Furthermore, this calls upon Congress to express an official expert opinion upon a subject which physiologists and chemists have not yet demonstrated.

Third. This section is based upon sentimentality, old maids having a fondness for cats, and some people believing that dogs are almost human. The scientist can not allow such ideas to enter into his work. Not only is the dog a convenient animal for experimental purposes in certain cases, but if sentimentality is to enter into the question at all, we ought to be glad to turn a few of these useless, disease-breeding, and injurious, ownerless street curs to some account. Why a disease-producing and property-destroying ownerless cur or a kicking mule should have any more consideration from Congress than a cow, pig, rabbit, chicken, or pigeon is not clear to the scientist.

Much has been said about the faithfulness of "old dog Tray," but when one studies the diseases he produces and the property he destroys, one is compelled to admit that the dog is a greater curse than blessing, a greater enemy than friend, and more treacherous than faithful.

Fourth. If any public exhibitions occur, they should be suppressed. I have never heard of any such things and do not see that the Humane Society has shown the necessity for legislation upon this point.

Section 4: This is discussed above with section 2.

Section 5: Not only is this section absurd on the ground that the Commissioners, not being trained in animal experimentation, are incapable of judging either the methods employed or the results obtained, but the section is unjust and dangerous. It would lead to the premature publication of alleged results only half established and to newspaper scandal.

Furthermore, at the end of a series of experiments, the experiments go on record in the scientific journals, and they are, therefore, made public to a class of people which is able to judge them on their merits. Section 5 is one which under no circumstances should be allowed to pass.

Section 6: As a practical "vivisector" I protest most urgently against any such official inspection as is here proposed. My protest is based upon the following grounds:

1. In certain experiments, such as tests for hydrophobia, the operator takes his own life in his hands during the work, and it is only just to him that he should be allowed his entire and undivided attention for the operation. Sudden interruption by outside parties, either friends or foes, might easily result, and surely would result sooner or later, in distracting the attention of the operator from his dangerous work, and this might result fatally to the operator or his assistants, or defeat the experiment or lead to unnecessary pain to the animal.

If an operator has, for instance, given an animal sufficient anæsthetics to carry it through a given operation, a sudden interruption could easily delay the operation, thus leading to the recovery of the animal to consciousness before the operation is completed. More anæsthetics would, of course, be at hand, as is always the case, but a distraction by sudden interruption could very easily cause the operator to lose sight of the condition of the animal for a moment.

2. In case of a delicate cutting operation the undivided attention of the operator is necessary, not because of any danger to himself, but because of the possibility of a slip of the knife which would require that the operation be repeated upon another animal.

We must have absolute freedom from distractions while we are in an experiment, and the sudden appearance, at a critical moment, of outside parties would assuredly lead to a momentary distraction.

3. Unless it is assured that the inspectors are professionally educated men, acquainted with the conditions of research work and capable of judging of the necessity of the inspection, this system of inspection will be open to the same objection as the following proposal made in England some years ago:

[Extract from Report of Royal Commission on Vivisection.]

It has been proposed to prohibit experiment except in public halls, to which a certain portion of the nonprofessional public shall at all times have access. It appears to us that this proposal would, if carried into effect, tend to frustrate the experiment as regards its usefulness, and, perhaps, as regards the effective administration of anæsthetics also, since the most essential requisite for the conduct of a delicate experiment is that the person who makes it should be free from any mental interruption or disturbance; while the presence of ignorant spectators could do nothing to secure the real humanity of the experiment. An animal may be suffering exquisite torture, and yet (so far as we know) the worari poison may, by its effect upon the motor nerves, prevent the exhibition of any feeling. Or, on the other hand, an animal may make every demonstration of suffering, while the real sensation is destroyed. In the human subject, when chloroform is employed, or when by an injury to the spine the connection with the brain is interrupted, it sometimes happens that all the outward manifestation of pain is exhibited, when the patient afterwards disclaims having experienced any sensation of it. These effects are perfectly familiar to the instructed, but would be simply misleading to the uninitiated. (Blue Book, 1876, C. 1397, p. xix.)

4. In all probability professionally educated men would not lend their services to such a system of espionage. The views expressed by the supporters of the bill justify the apprehension that persons extreme in their views and antagonistic to scientific work would be urged for appointment as inspectors.

5. The proposition to thus subject scientists to espionage in their work is as unjust as would be a proposition to provide for an inspection of the amphitheaters of hospitals during critical surgical operations, or of the private sick room during the visits of family physicians, in order to see that anæsthetics were used or that the patients were properly nursed.

Section 7. Here, again, we find the conspicuous ignorance as to the class of men engaged in animal experimentation. Why a professor of anatomy is accepted, but not one of histology, pathology, embryology, zoology, biology, etc., is a narrowmindedness which is absurd.

The third paragraph is one which might cause serious delay in important cases, such as tests for hydrophobia and glanders, which might result fatally to the patient who, if the test had been performed in time, might have lived.

IV. The following brief statement of investigations by the Bureau of Animal Industry, though not complete, is sufficient to set forth the

value of animal experimentation to the agricultural and commercial interest of the country:

Division of Animal Pathology. (1884–1896.)

[Present chief, Dr. V. A. Moore; former chief, Dr. Theobold Smith.]

The discovery of the power to produce immunity with sterilized cultures.

Investigations into the various methods of protecting swine against swine plague and hog cholera by inoculations.

Investigations to determine if the disease of cattle existing in the United States in 1884 was identical with the contagious pleuro-pneumonia of Europe.

The discovery of the bacillus of swine plague, the determination of its power to resist disinfectants, and the methods for preventing the spread of the disease.

Investigation to determine if the vaccine for the disease known as rouget of swine could be used to prevent hog cholera.

The determination of several varieties of hog cholera and swine plague.

The discovery of the specific cause of Texas fever, the way it is transmitted from the Southern to Northern cattle, and consequently the development of methods by which cattle from the infected districts in the South may be shipped to the Northern markets without spreading the disease.

The discovery of the cause of a destructive disease in turkeys and the method by which the disease is transmitted.

Experiments which have shown that a disease of cattle known as the cornstalk disease is not a contagious disease.

The determination of rabies in outbreaks of cattle disease, the nature of which was heretofore not understood.

The diagnosis of rabies in a large number of dogs in the District of Columbia and vicinity.

Many investigations which have shed much light upon the variability of infectious diseases, and upon the efficiency of attenuated, filtered, and heated cultures, blood serum from immune and healthy animals in producing immunity against infectious diseases of animals, such as hog cholera and swine plague.

The discovery of pathogenic bacteria resembling the swine-plague bacillus in the air passages of a large percentage of the domesticated animals. This is important in explaining the cause of sporadic pneumonia.

Investigations into the pathology of diphtheria in poultry.

Investigations into the pathology of sporadic pneumonia which have been of great value commercially, as it has frequently been diagnosed contagious pleuro-pneumonia.

Extensive investigations into the nature of glanders, anthrax, symptomatic anthrax, and tuberculosis, which have been of great value in enabling a positive diagnosis to be made and means afforded for preventing their spread to other animals, and possibly man.

Biochemic Laboratory. (1890–1896.)

[Dr. E. A. de Schweinitz, chief.]

Isolation of the poisons of the hog-cholera germ and their relation to immunity from this disease.

Isolation of the poisons of the swine-plague germ and their relation to immunity.

Further study of the poisons of the glanders bacilli and their relation to immunity and the practical use of mallein.

Further study of the poisons of the tuberculosis bacillus and the practical value and use of tuberculin.

The isolation and study of the attenuated tuberculosis bacillus and its relation to immunity.

The isolation and study of an attenuated diphtheria bacillus.

The possibility of the transmission of disease by oleomargarine, etc.

The immunizing property of the blood serum from animals vaccinated against the hog-cholera and swine-plague germs.

The curative value of the serum of animals immune to tuberculosis.

Zoological Laboratory. (1891–1896.)

[Dr. Ch. Wardell Stiles, chief.]

Experiments upon the life history of various animal parasites, as:

Determination of the life history and American intermediate host of the giant thorn-headed worm (*Echinorhynchus gigas*) of hogs.

Refutation of the supposed direct development of the adult cestodes (particularly *Moniezia expansa* and *M. planissima*) of cattle, sheep, and allied animals.

Demonstration of the nontransmissibility of *Tænia saginata* to sheep, thus excluding mutton as source of infection of man by this tapeworm.

Numerous experiments on the transmissibility and nontransmissibility of various scab mites from one animal to another.

Studies on the life history of the large American Fluke (*Fasciola magna*) of cattle.

Numerous experiments upon trichinosis in order to determine the duration of "pickling" necessary to render trichinous pork wholesome.

Experiments in the determination of doses of certain anthelmintics.

Experiments upon the vitality of the eggs of certain parasites.

V. A bill very similar in some respects to the bill now before you was recently introduced into the Massachusetts State legislature. It was finally decided that there was no cause for legislation upon this subject. As many points brought out in the Boston hearing have a direct bearing upon the present bill now before you, I desire to submit the report of the Boston hearings as an appendix to the above remarks, in case the manuscript arrives in time.

I would further state that memorials are on their way from various scientific societies protesting against this bill, and in view of the pernicious effect which the medical and scientific men in the District believe the passage of this bill would have upon research work, not only here but elsewhere, I would most respectfully suggest that the decision of the committee be delayed until the medical and scientific men of the entire country have an opportunity to express their views.

STATEMENT OF HON. CHARLES W. DABNEY, ACTING SECRETARY OF AGRICULTURE.

Mr. Dabney submitted the following statement in writing:

I have the honor to invite your attention to certain provisions of the bill S. 1552, "A bill for the further prevention of cruelty to animals in the District of Columbia." The principal purpose of the bill as disclosed by its several sections is to restrict and prohibit those experiments upon animals without which it is impossible to obtain the facts required for the advancement of the biological sciences, and particularly for understanding the nature of disease and discovering the best means for its prevention and cure. As the Bureau of Animal Industry of this Department is charged by law with the duty of investigating and controlling animal diseases, and as it has made and is making more extensive investigations of said diseases than any other institution in the United States, the work of said Bureau would be directly and seriously affected by legislation such as is proposed in this measure. The bill, while ostensibly local legislation, would affect principally the work of the Executive Departments, and more particularly the scientific investigations of the Department of Agriculture.

1. The bill provides that hereafter no person shall perform on a living animal any experiment calculated to give pain to such animal, and it makes any person guilty of an offense who performs or takes part in any such experiment which in any way contravenes the provisions of this bill, and for such offense, if the first, he is liable to the excessive penalty of $150 fine; or if the second offense he is liable to a fine of $300 or to imprisonment for a period not exceeding six months. These extreme penalties would discourage investigators; they would cause hesitation and delay in the performance of necessary experiments, for no one would enter upon a series of researches until he had satisfied himself that he could carry them through without even a technical violation of the act, and that he could satisfy even unfriendly inspectors that there was no technical violation.

Such hesitation and delay is fatal to experimental work of the character performed in this Department. It often requires months, sometimes years, to find an outbreak of disease of the right type and with the affected animals at the proper stage to yield results to the investigator. If it is a contagious disease, the experimental animals must be exposed to or inoculated with the liquid excretions or tissues of the affected individual, and this must be done under a variety of conditions. Such material is perishable, and when found must be used at once. The experiments for which it is suitable must be immediately planned and executed, otherwise the valuable material is lost. Hence the desirability of leaving investigators free from unnecessary restrictions and of encouraging them to their best efforts by recognizing their valuable contributions to the cause of humanity. The effect of this section would be to place experimentation upon animals under the ban of the law, to put a stigma upon it, and to cause those engaged in such researches to expend a large part of their energy and ability to avoid infraction of the numerous restrictions.

2. It is provided in section 2, paragraph *a*, that such experiment must be performed with a view to the advancement by new discovery of physiological knowledge or of knowledge which will be useful for saving or prolonging life or alleviating suffering; that is to say, it forbids all experimentation to confirm the results obtained by others or to determine whether their results are exactly accurate or whether such conclusions apply under the conditions which obtain in this country. This provision at once prohibits a large part of the necessary experimental work of this Department and would seriously cripple the remainder. Every experiment becomes an offense which does not lead to an immediate practical result. It so happens, however, that no one experiment can give such results except in extraordinary cases. Science is built up by degrees; we progress a step at a time, and many experiments must be made to determine the facts in the case before we can foresee the results. If the experimenter must stop to consider whether he can demonstrate to the satisfaction of a court that each individual experiment was "performed with a view to the advancement by new discovery of physiological knowledge or of knowledge which will be useful for saving or prolonging life or alleviating suffering," it is not likely that he will accomplish much by his work.

3. "The experiment must be performed by a person holding such license from the Commissioners of the District of Columbia as in this act mentioned." The substitute bill adds the words "or by a duly authorized medical officer of the Government of the United States or of the District of Columbia." The provision in each bill is objectionable. The first-mentioned bill makes the work of this Department dependent upon the action of the Commissioners of the District of Columbia, and would allow these Commissioners to dictate as to the persons who should be employed in this scientific work. The substitute bill allows experiments to be performed by a duly authorized medical officer of the Government of the United States without a license. This would still exclude a large proportion of our men engaged in experimental work, who, while graduates in science and perfectly competent, could not be considered medical officers. It appears from an examination of the records that some of our best men in the past would not have been allowed to serve under this provision.

4. The bill provides that—

> Notwithstanding anything in this act contained, no experiment calculated to give pain shall be performed on a dog or cat, except upon such certificate being given as in this act mentioned, stating, in addition to the statements hereinbefore required

to be made in such certificate, that for reasons specified in the certificate the object of the experiment will be necessarily frustrated unless it is performed on an animal similar in constitution and habits to a cat or dog, and no other animal is available for such experiment; and an experiment calculated to give pain shall not be performed on any horse, ass, or mule, except on such certificate being given as in this act mentioned, that the object of the experiment will be necessarily frustrated unless it is performed on a horse, ass, or mule, and that no other animal is available for such purpose.

Section 7 provides:

That any application for a license under this act, and for a certificate to be given as in this act mentioned, must be signed by three physicians duly licensed to practice and actually engaged in practicing medicine in the District of Columbia, and also by a professor of physiology, medicine, anatomy, medical jurisprudence, materia medica, or surgery in the medical department of any duly established reliable school or college in the District of Columbia: *Provided*, That when any person applying for a certificate under this act is himself one of the persons authorized to sign such certificate, the signature of some other of such persons shall be substituted for the signature of the applicant.

* * * * * * *

A copy of any certificate under this section shall be forwarded by the applicant to the Commissioners of the District, but shall not be available until one week after a copy has been so forwarded. The Commissioners of the District may at any time disallow or suspend any certificate given under this section.

These provisions prevent the use of five species of animals in experiments, except upon special certificate being given. The form of this certificate and the manner in which it is to be obtained or given are indefinite, and it can not be clearly understood from the language of the bill what kind of a certificate is intended. The fact that an application for a certificate must be signed by three physicians and by a professor in a medical college makes the work of an Executive Department of the United States Government dependent again, in this instance, not only upon the Commissioners of the District, but upon the action of individuals in the District of Columbia who have no connection either with the United States Government or the District government. Such a provision is, I believe, unprecedented in legislation affecting the Executive Departments.

The language quoted makes it plain that a certificate must be given for each experiment, or certainly for each series of experiments, made upon any of the animals mentioned. As these certificates are not available until one week after a copy has been forwarded to the Commissioners of the District, experiments upon these animals are practically prohibited. As before explained, experiments can not be planned or performed until the material to be used in such experiments is obtained, and such material being perishable, a delay of a week would lead to its total loss, and thus prevent the experiment being carried out. This refers to experiments with contagious diseases or with animal parasites, which are the principal ones conducted under the direction of the Bureau of Animal Industry.

All investigation concerning the diseases of horses, asses, and mules would practically be stopped by the proposed legislation, and the testing of horses with mallein to determine if they are affected with glanders would only be possible after a week's delay to obtain a certificate. Glanders is one of the diseases which it is the duty of the Bureau of Animal Industry, in cooperation with the Commissioners of the District of Columbia, to eradicate from the District. If a suspected horse is found it should be tested at once. A delay of a week gives an opportunity for the escape of the animal from supervision, and is under any circumstances a hardship to the owner, as well as a peril to the people and horses exposed to the affected animal. Efforts to control conta-

gious diseases must be prompt and vigorous if they are expected to bring success. Such legislation as is proposed in the bills mentioned would make the eradication of glanders impossible.

5. It is provided in section 4 of the substitute bill that a license shall not be granted to any person under the age of 25 years unless he be a graduate from a medical college duly authorized to practice medicine in the District of Columbia.

This provision effectually excludes from experimentation any graduate in science under 25 years of age unless he is duly authorized to practice medicine in the District of Columbia. It would at once stop some of the experiments now in progress, and if it had been enforced in past years would have prevented a large proportion of our scientific employees from doing this class of work. Taken in connection with paragraph *b* of section 2, which provides that experiments must be performed by persons holding a license from the Commissioners of the District or by a duly authorized medical officer of the Government of the United States or of the District of Columbia, it is readily seen that young men, graduates in zoology or in other collateral sciences, could not make experiments even if they were competent and in the service of an Executive Department of the Government.

6. The bill also provides that the Commissioners of the District may direct any person performing such experiments under this act from time to time to make reports to them of the result of such experiments, in such form and with such details as the said Commissioners may require. The substitute bill makes this report cover the methods employed as well as the results of the experiments. This provision is objectionable, because it makes the employees of an Executive Department subject to the directions of the Commissioners of the District in making their reports. It permits reports to be called for before the investigations are completed, and the official work of these experts might be stopped at any time by a demand from the Commissioners for a report as to the methods being employed and results of the experiments.

I would respectfully suggest that it is improper, and not in accordance with precedent, for the employees of an Executive Department of the Government to report directly to the Commissioners of the District. Their report should be made to the head of the Department, and if any report is to be made to the Commissioners it should be made by or transmitted through the head of the Department. Even this would be objectionable, as the work of the Departments should not in any way be subject to or dependent upon the local authorities.

7. It is provided in section 6 "that the Commissioners of the District shall cause all registered places to be from time to time visited by inspectors, without previous notice, for the purpose of securing compliance with the provisions of this act, and shall appoint and authorize an agent of the Washington Humane Society to make such inspection, and may also appoint such special inspectors as they may think fit, either permanently or temporarily, who may be willing to act as such inspectors gratuitously."

The substitute bill provides:

> That the President of the United States shall cause all places where experiments on living vertebrate animals are carried on, in the District of Columbia, to be, from time to time, visited and inspected without previous notice, for the purpose of securing compliance with the provisions of this act; and to that end shall appoint four inspectors, who shall serve without compensation, and who shall have authority to visit and inspect the places aforesaid, and who shall report to the President of the United States from time to time the results of their observations therein, which shall be made public by him.

It must be plain that the results of all of these limitations and restrictions and of this espionage will be the prevention of scientific research rather than its regulation. As long as this Department is directed by Congress to make investigations of animal diseases, and to provide for their suppression and control, the Department should be left free to carry on such work in such manner as may seem best to the Secretary of Agriculture in order to attain the end in view. The Department must always be under the direction of responsible officers who may be called upon by the President at any time for information, and a board of inspection composed of persons not in the Government service and who serve gratuitously, is not needed, and would not be in the interest of efficient service.

8. An apparent concession is made in section 2, paragraph *c*, which provides:

> That in so-called inoculation experiments or tests of drugs or medicines, the animal need not be anæsthetized nor killed afterwards nor in tests of surgical procedure need animals be kept completely anæsthetized during the process of recovery from the surgical operation.

This concession is, however, apparent rather than real. The investigator remains subject to all the other limitations of the bill. (1) If not a duly authorized medical officer of the Government of the United States or of the District of Columbia, he must first obtain a license. (Sec. 2 *b*.) (2) His application for a license must be signed by three physicians duly licensed to practice medicine and actually engaged in practicing medicine in the District of Columbia, also by a professor of physiology, medicine, anatomy, medical jurisprudence, materia medica, or surgery in the medical department of any duly established reliable school or college in the District of Columbia. (Sec. 7.) (3) The Commissioners may require the place where the experiments are made to be registered. (Sec 3.) (4) If under 25 years of age and not duly authorized to practice medicine in the District of Columbia, he can not obtain a license. (Sec. 4.) (5) He must, if authorized to experiment at all, confine his experiments to the advancement, by new discovery, of physiological knowledge or of knowledge which will be useful for saving or prolonging life or alleviating suffering. (Sec. 2 *a*.) (6) If the experiment is to be made upon a dog, cat, horse, ass, or mule, a certificate must be given (it is not specified by whom) stating, in addition to certain other statements, that for specified reasons the object of the experiment will be necessarily frustrated unless it is performed on an animal similar in constitution to a cat, dog, horse, ass, or mule, and that no other animal is available for such purposes. (Sec. 2, par. *e*, 3d part.) (7) Any application "for a certificate to be given as in this act mentioned must be signed by three physicians duly licensed to practice and actually engaged in practicing medicine in the District of Columbia, and also by a professor of physiology, medicine, anatomy, medical jurisprudence, materia medica, or surgery, in the medical department of any duly established reliable school or college in the District of Columbia: *Provided*, That when any person applying for a certificate under this act is himself one of the persons authorized to sign such certificate, the signature of such other of such persons shall be substituted for the signature of the applicant." (Sec. 7.) (8) Such certificate shall not be available until one week after a copy has been forwarded to the Commissioners of the District. (Sec. 7.) It is not stated to whom the application for this certificate shall be made. (9) The investigator must hold himself ready to report at any time to the Commissioners of the District both the methods employed and the results of the experi-

ments, in such form and with such details as the said Commissioners may require. (Sec. 5.) It makes no difference how premature the report may be, or how damaging to the investigator to publish it before the results are completed, there is no recourse. (10) The investigator, his animals, methods, and experiments are to be subject to the constant inspection and espionage of four inspectors, to be appointed by the President, who shall serve without compensation, and who shall report to the President the results of their observations. (Sec. 6.)

It can hardly be supposed that a scientific man could master all of these requirements and limitations of the law without embarrassment and injury to his work, or that he could conduct a series of experiments to a successful issue without contravening some of them and making himself liable to the extreme penalties provided for such an offense. The assertion that the effect of either the original bill or the substitute will be simply to regulate experiments and prevent abuses are absurd in the light of an analysis of the provisions. The effect will be practically prohibitive, and there is good reason to believe that this is the result aimed at by those who drafted the bills.

It appears that this bill (S. 1552) was formulated by the antivivisection committee of the Washington Humane Society (Annual Report, 1895, p. 24), and I am informed that a substitute bill has more recently been proposed by the said antivivisection committee. An examination of the proposed substitute does not, however, disclose any material modification of the provisions existing in the original bill. Both have evidently been drawn by persons hostile to scientific investigations which must be made through experimentation upon animals. The sentiment of the society which procured the drafting of these bills is well summarized in the report of its president for the year 1894. He said—

> The subject of vivisection [experiments upon animals] has been frequently before your executive committee during the past year, and but one sentiment has been expressed, viz, that of utter abhorrence and condemnation of the inhuman practice which, according to the oft-expressed opinion of the best physicians and surgeons, is of no practical value to science or medicine. (p. 18.)

It is not surprising that people holding such views should endeavor to graft them upon the legislation of the country, and we must bear in mind the fact that those who drafted these bills are hostile to experimentation and desire to abolish rather than to regulate it.

The investigations which the Bureau of Animal Industry has made have been so successful as to attract the attention of the scientific world, and they have required constant experimentation upon animals. Some of those experiments have been painful to the animals operated upon, but they have been in charge of scientific and humane persons who have exerted themselves to prevent any unnecessary suffering. Such experiments which are intended to supply the knowledge required for protecting our domestic animals from disease, and for securing a food supply from them uncontaminated by disease, and which also contribute to the prevention and cure of human maladies, are less subject to the charge of cruelty, even though they cause pain, than are the ordinary practices of dishorning, emasculation, branding, and slaughtering, all of which are countenanced for economic reasons and cause more pain than do scientific experiments. So long as we admit that an animal may be caused to suffer the intense pain of castration in order that it may be more economically raised and better suited for the service of man or for the production of edible meat, so long as we permit millions of delicate calves to be burned with a red-hot iron upon their sensitive skins in

order that they may be identified, and so long as we admit that animals may be killed by painful processes to supply us with food, it is inconsistent to say that they can not be used in experiments necessary for the advancement of knowledge, the relief of suffering, and the saving of property and life.

The first investigations of this kind which this Department was directed by Congress to make related to the diseases of swine, and these investigations have been continued until those diseases which cause the principal losses are well understood and can be controlled by the application of proper measures.

The Bureau of Animal Industry was established principally to avert the great danger which threatened our cattle industry from the existence on our territory of that cattle plague known as the contagious pleuro-pneumonia of bovine animals. Other countries had struggled with it in vain, but it had never, up to that time, been eradicated from any country in which it had gained a considerable distribution. The nature of the disease, and the best methods of controlling it were imperfectly understood. The experiments made here upon animals gave sufficient information, however, to enable those charged with the work to mark out a systematic and scientific plan of operations, which led to the complete eradication of the disease in less than five years. Although four years have passed since this work was completed, the predictions of the scientists have been fulfilled to the letter, and no cases of the disease have been found during that time. Previous to this work being undertaken the disease had existed constantly and extensively for more than forty years, and many persons had become so accustomed to it that they freely predicted its immediate reappearance, even if it was stamped out.

An illustration of the absolute necessity of experiments upon animals to settle contested questions relating to disease may be drawn from the existing restrictions of the British Government on the American cattle trade. Although there has been no pleuro-pneumonia in this country for over four years, the British inspectors frequently condemn our cattle as being affected with that disease. The American inspectors and many European veterinarians hold that the disease actually discovered is ordinary pneumonia arising from exposure during the ocean voyage. How then can this difference of opinion between the British and American officers be settled? Not by clinical observation, not by discussion, not by diplomacy, for all of these have been tried. A scientific and incontestable demonstration could be made by exposing healthy cattle to those said to be affected with contagious pleuro-pneumonia. This would be a final and unanswerable test, but no such test can be secured. They have limited experimentation upon animals in Great Britain by law. Objections have been raised to such an experiment, and this question can not be brought to a final issue. If the bill under discussion should unfortunately become a law, an experiment could not be made at the seat of the United States Government to settle this important question, even should it become possible for other persons to make the experiment here. The experiment would be calculated to give pain; it would not be an inoculation experiment or a surgical procedure, and, consequently, it would be necessary, according to this bill, to keep the animals in the experiment, say 20 head of cattle, completely under the influence of ether or chloroform for the three or four weeks during which the animals might feel more or less pain. Such a requirement is absurd and impossible of fulfillment.

This is not an unusual or overdrawn case. It is only an illustration

of contested or unsolved questions frequently coming before this Department for solution, and which it is of the greatest importance to the agricultural industry to have settled reliably and permanently.

Another great work which the Bureau has done by experimenting upon animals is the elucidation of the nature, the mode of dissemination, and the means of preventing the disease known as Texas fever of cattle. This disease was causing enormous losses to farmers by death of their stock, was demoralizing the cattle industry of a number of Western States and Territories, and was causing such fatality among cattle en route to foreign countries that the propriety of admitting our animals was questioned and the insurance during the summer months was advanced to 10 per cent of the value of the animals. Now all of this has been changed; outbreaks of Texas fever in this country are rare and unimportant, and the insurance on export cattle has been reduced to 1 per cent or less.

These are only a small part of the results accomplished by the Bureau of Animal Industry through this kind of experimentation. Such researches are difficult, and they are successfully conducted only where the conditions are favorable and where the investigators are stimulated by friendly encouragement and support. It may be safely said that under hostile legislation, classifying such experiments as a form of cruelty, surrounding them with numerous limitations and restrictions, subjecting the experimenter to the espionage of intolerant inspectors, and threatening him with excessive penalties for infractions of any of the many requirements, the success which we now point to with pride would not have been achieved.

There are still many problems relating to animal diseases which must be investigated and solved by this class of experiments before the animal industry can yield to our farmers an adequate return. Agriculture demands and should receive all the assistance which can be given to it by the most advanced scientific methods employed under the most favorable conditions. We find to-day many of the dairy herds affected to the extent of 70 to 90 per cent with tuberculosis; we find the swine fed upon the refuse milk of such dairies affected with the same disease, and we have every reason to believe that much of the tuberculosis in people comes from the same source. Is the Bureau of Animal Industry to be interrupted and hampered in its study of this and other diseases by legislation alleged to be for the prevention of cruelty to animals when the promoters of this legislation have failed to show that any improper experimentation has been conducted or is likely to be conducted in the District of Columbia?

Are the vital interests of agriculture in the whole United States to be made subservient to the demands of an over-zealous and intolerant local society, which appears incapable of taking a broad and liberal view of this subject? Are we prepared, in order to protect a few dogs, cats, and other animals from sufferings less than these animals usually undergo when they die a so-called natural death, to have legislation enacted which would withdraw the efforts of the scientists who are working for the relief of the hundreds of thousands of men, women, and children who now die annually in this country from preventable diseases? Are the millions of animals which suffer and die from animal plagues every year less worthy of attention than the few which die with less pain in the research laboratory? These questions appear not to have occurred to those who are advocating this legislation. The effort to limit, obstruct, and prohibit such experiments, although it originates from humane societies, is not in the cause of true humanity; it ignores

the interests and sufferings of mankind and would perpetuate these sufferings to carry into effect what is clearly an erroneous view of what constitutes kindness and humanity to the lower animals.

If the legislation already enacted for the prevention of cruelty to animals in the District of Columbia is shown to be insufficient for this purpose, and additional legislation is thought desirable, this legislation should be so framed as not to affect the Executive Departments of the United States Government, and under no circumstances should local legislation be allowed to interfere with, demoralize, or prohibit the important scientific investigations which are specifically authorized by Congress for the benefit of the great agricultural industry of the whole country.

Agriculture at this time needs the encouragement and assistance which the experimental work of the Bureau of Animal Industry is bringing to it. Much has already been accomplished, but even greater results are promised in the near future. It is an age of science and progress, and all other industries are rapidly advancing through scientific research. Should not our farmers receive all possible aid from the same source?

STATEMENT OF DR. WALTER WYMAN, SUPERVISING SURGEON-GENERAL MARINE-HOSPITAL SERVICE.

Dr. Wyman submitted the following statement in writing:

Referring to Senate bill 1552, for the further prevention of cruelty to animals in the District of Columbia, the effect of which, if enacted into law, will materially retard scientific work in the interest of humanity, I wish, by way of protest, to invite attention to the practical results which have been obtained by the use of antitoxin in the treatment of diphtheria, which results would have been unattainable if science had been restricted in the manner proposed in this bill. The Marine-Hospital Service was one of the first agencies in the United States through which the antitoxic serum was prepared and distributed. A school of instruction was opened in its laboratory for the benefit of municipal and State health officers, and by act of Congress the Bureau was directed to cooperate with the health officer of the District of Columbia in the prevention of diphtheria. A collective investigation in order to show the practical results of the work has been conducted by the Bureau, and the following statistics have been obtained:

In 109 cities of the United States, with a total population of 11,125,000 (according to the census of 1890), from 1891 to 1894, inclusive, there were 131,620 cases of diphtheria and croup, with 51,820 deaths, a mortality of over 39 per cent. This is a fair estimate of the mortality of the disease without the use of antitoxin. In 1895, 5,125 cases of diphtheria and croup are recorded as having been treated with antitoxin with a mortality of 552 or 10.7 per cent, and during the same period and in the same localities 2,936 cases were treated without the use of antitoxin with a mortality of 1,110 deaths, a death rate of 40 per cent.

Additional statistics in further illustration of the value of antitoxin might be readily cited here, but will appear in other communications. These are sufficient to demonstrate the value of this remedy, which could not have been prepared under the restraints proposed by this bill.

I have been informed that it has been suggested to amend the bill so that it shall not affect experimental inoculations, but there is no consistency in making such exception, for it is well known that animals

suffer as much from the after effects of experimental inoculation as from the minor operations connected with vivisection. The same principle which would prevent the bleeding of a horse for the purpose of obtaining the antitoxic serum should prevent his inoculation for the purpose of producing it, or the inoculation of any animal with any germ of disease which will cause illness. Had this principle prevailed there would have been no discovery of the bacillus of cholera, upon which the suppression of that hitherto irrepressible disease has become a scientific and practical possibility. In fact, I may add that the quarantine methods of the present day, through which epidemic diseases are excluded from the United States by scientific disinfection, have their basis in these experiments.

STATEMENT OF DR. J. J. KINYOUN, PASSED ASSISTANT SURGEON, MARINE-HOSPITAL SERVICE.

Dr. Kinyoun submitted the following statement in writing:

I have the honor to invite attention to a certain bill introduced in the Senate (S. 1552), which has for its object the restriction and control of experimentation on animals. This bill, if it becomes a law, will materially affect the scientific research work of the laboratory of the Marine-Hospital Service as well as that of the Medical Department of the Army and Navy and the Bureau of Animal Industry. The reasons given by the promoters of the bill for need of such legislation is the fact that there now exists in the District of Columbia the aforesaid biological laboratories in which experimentation and vivisection of animals are performed. It is also claimed that in these laboratories the infliction of pain and unnecessary cruelty upon animals is constant and of common occurrence.

Further, it is claimed that such experiments are performed in public schools and the medical colleges. The biological laboratories of the several Departments of the Government located in the District of Columbia have been established by acts of Congress, and have for many years received its sanction. It is quite remarkable, if such a condition of affairs exists, that no notice has been thus far taken by Congress save favorable action in appropriating funds for the continuance of investigations. It has been heretofore stated to me by persons who are now the most ardent advocates of the bill that the object of this agitation is to have enacted some law bearing upon vivisection and animal experimentation which will allow these persons to supervise and control all research work in these laboratories, with the ultimate purpose of abolishing it altogether. I am convinced that the same sentiment and purpose exists now as formerly, because similar expressions have been recently made by the advocates of the bill.

I have been connected with the laboratory of the Service, as you well know, since its institution (1887), and have been in a great measure responsible for the character and manner of conducting the investigations therein. On account of these allegations I feel it my duty, both to the Service and myself, to call in question these statements with regard to the cruel manner in which the research work of the laboratories is performed. It will not be necessary to review in detail what has been accomplished since the institution of the laboratory, because much of it is a matter of record, but to state that our researches have been in the line of investigations relating to the cause and prevention of quarantinable diseases and other matters pertaining to the public health. These investigations have been made subjects of reports to

the Bureau, and are a matter of record. Many of the subjects investigated in laboratory, by reason of their nature, required experimentation upon animals, for without such it would have been impossible to arrive at any conclusion of value. Our present methods of management of the contagious and infectious diseases rests entirely upon such laboratory investigations. Notwithstanding the wonderful progress made in the prevention of diseases during the past twenty years—especially those designated as acutely contagious maladies—it has been stated by the opponents of vivisection and experimental research that all the knowledge for our guidance has been gained in the broad lines of common experience, and little, if any, benefits to the human race have been added by these cruel and awful experiments. These allegations are not worthy of being called arguments, for to anyone of unbiased mind the record should speak for itself.

To better illustrate what has been done with one disease in particular, let us consider the status of the disease diphtheria. The lesson taught by the year 1895 should bear some little conviction, even to the most skeptical. During the past six months the Bureau has been engaged in a collective investigation showing the prevalence of and mortality from diphtheria and croup in the cities of the United States having a population of 25,000 and over. In 109 cities, having a population of 11,125,000, there occurred, from 1891 to 1894, inclusive, 131,620 cases of diphtheria and croup, with 51,820 deaths—a mortality of over 39 per cent. In 1895, in the same cities, there occurred 45,690 cases, with 11,640 deaths, or a death rate of 25 per cent as compared with the average 39 per cent of the four years previous. It is also remarkable that the diminution of the death rate has been in those cities where the diphtheria antitoxin has been in extensive use, and has remained stationary in others where its use was limited. The greatest diminution appears in the cities of New York, Brooklyn, Washington, St. Louis, Chicago, and Boston, where a large quantity of antitoxin has been used. This does not imply that antitoxin has been used in every case occurring in these places where the death rate has been lower. To form some estimate of the actual value of the remedy for the control of diphtheria, as well as for reducing the death rate, I have tabulated, from reports sent to this Bureau by health officers and other authentic sources, a number of cases treated with antitoxin, which I hope will be convincing arguments in favor of the remedy. In 1895, 5,125 cases of diphtheria and croup were treated with antitoxin, with a death rate of 552, or 10.7 per cent, while of 2,936 cases occurring synchronously in the same places there were 1,110 deaths—a mortality of 40 per cent.

In addition to the above, I have also collected 2,400 cases which have been exposed to diphtheria or were found to have the diphtheria baccilli in their throats. These were immunized with the remedy, with the result of 19 mild cases occurring, and the majority of those within two days after the injection, and in none of these were unpleasant results noticed. Prof. William H. Welch, of Johns Hopkins University, has collected 7,166 cases of diphtheria occurring in Europe from 1894 to 1895, which were treated with antitoxin, with a mortality of 17 per cent against 2,279 cases occurring synchronously not treated with antitoxin, with a death rate of 42 per cent. Compiling these two reports we have 12,332 cases treated with antitoxin, with a mortality of 14 per cent against 5,215 cases not treated with antitoxin, with a mortality of 41 per cent. From the study of the reports received from the 109 cities, having a population of 11,125,000, it would be safe to infer that there have occurred in the United States during the past five years over 250,000 deaths from diphtheria and croup. If antitoxin could have

been obtained and used in all cases of diphtheria occurring in the United States during the past five years, it would be safe to say that there would have been saved at the lowest estimate 150,000 lives. These five years represent an epoch in the prevention and treatment of diphtheria, for it was during this time that Behring, Roux, and their collaborators were patiently pursuing their labors with this purpose in view. The reports of the efficacy of the remedy are not confined to this country. The same come from all parts of the world. One of the most striking is submitted by Dr. Monod, director of the public health department of France:

M. Henri Monod, of the public health department of France, has recently communicated to the Academy of Medicine certain statistics which have an important bearing upon the value of the antitoxin of diphtheria. In 108 towns of 20,000 inhabitants and over, with an aggregate population of 8,150,000, the average number of deaths from diphtheria during the first six months of the seven years 1888–1894 was 2,627. In the three months, November, 1894, to January, 1895, the Institut Pasteur distributed over 50,000 supplies of antitoxin serum, and this supply, which was maintained, was made available not only for the well-to-do, but also for those who by reason of poverty were compelled to receive it by means of gratuitous distribution. Now, in the first six months of 1895 the number of deaths from diphtheria in the same 108 towns was only 904, or a diminution at the rate of 65.6 per cent. The rate of diminution, month by month, went on almost uniformly from one of 56.2 per cent for the month of January to 47.5 per cent for the month of June. On these data alone a saving of 15,000 lives would have been effected during the first half of 1895.

Notwithstanding this array of facts presented in regard to diphtheria, many of the advocates of this proposed legislation—I may say the majority—are unwilling to admit that the use of such a remedy is of value or the means of producing it justifiable. To better illustrate the undercurrent of feeling which is entertained regarding the value of such experiments conducted upon animals for the prevention and cure of diphtheria, I call to mind an incident which occurred in this city about two and one-half years ago. I had consented to appear before a certain society for the purpose of stating what had been accomplished by the scientific researches of the laboratories in the prevention of disease. On explaining the value of our methods in preventing diphtheria, I was told by several female antivivisectionists that they would sooner let a child die of diphtheria than to save its life by the sacrifice of a guinea pig. I hope none of them were mothers. To further illustrate this peculiar order of mind, or rather disorder of mind, I beg to recall an order which emanated from this Bureau, directing me to investigate the claims made for the treatment of cholera by cobra venom. This substance was claimed by Perroux, of Calcutta, to be an infallible remedy against cholera, and that it had been used by the mountain tribes of India for many years in the treatment of disease with wonderful success. In carrying out the spirit of the order, and in order to arrive at the proof, it became necessary to resort to experiments upon animals. This fact happened to be mentioned by the daily press simply as a news item. A few days thereafter I began to receive anonymous letters, two of which I wish to submit as evidence:

LETTER No. 1.

You vile, merciless, rascally fiend. I judge from your name you are a nasty Frenchman with no heart and without a God. If you think you will be permitted to set up a place of torture in this country for poor animals you are vastly mistaken. You will have to betake yourself to the vile and Godless country from which you came or to the hell to which you are destined, and if you wish to indulge in such fiendish performances when you reach the latter place—which I hope you will soon—unless you repent, you will have an opportunity with kindred fiends of torturing yourself through the endless ages of eternity. I am a woman who despises brutes and all brutal actions.

LETTER NO. 2.

When pain—the most awful sensation of the human frame—exists let its alleviation or study prove the sole lawful guide to future cases.

Only the most damnable fiend cloaked in human form ever lifted the knife in vivisection. May the curse of an all-merciful God rest upon you. Laugh, sneer, such as you do; but may every agony your hellish minds and hand inflicts be trebled upon yourself in this world and the one to come and upon all like you. May your deathbed be such a scene of horror that all will forsake you. May God's curse be upon you.

In conclusion I wish to quote the words of Professor Welch, who has spoken so clearly and forcibly on the value of the antitoxin treatment of diphtheria:

The principal conclusion which I would draw from this paper is that our study of the results of the treatment of over 7,000 cases of diphtheria by antitoxin demonstrates beyond all reasonable doubt that antidiphtheritic serum is a specific curative agent for diphtheria, surpassing in its efficacy all other known methods of treatment for this disease. It is the duty of the physician to use it.

The discovery of the healing serum is entirely the result of laboratory work. It is an outcome of the studies of immunity. In no sense was the discovery an accidental one. Every step leading to it can be traced, and every step was taken with a definite purpose and to solve a definite problem.

These studies and the resulting discoveries mark an epoch in the history of medicine. It should be forcibly brought home to those whose philozoic sentiments outweigh sentiments of true philanthropy that these discoveries which have led to the saving of untold thousands of human lives have been gained by the sacrifice of the lives of thousands of animals, and by no possibility could have been made without experimentation upon animals.

STATEMENT OF DR. ALBERT LEFFINGWELL, OF CAMBRIDGE, MASS.

Mr. CHAIRMAN AND GENTLEMEN: If I had been asked to speak to-day in behalf of a measure that should abolish vivisection in the District of Columbia, I should have refused without a moment's hesitation. It is the misfortune of our language that a single word must include every phase and form of investigation into the phenomena of what we call life; that we must use it for experiments that are absolutely painless, and for those involving torments as acute and prolonged as the imagination can conceive; for experiments of great utility as well as those which have not the slightest conceivable relation to the treatment of disease or to any practical end. It has always seemed to me that careful distinctions were never more necessary than in according approval or condemnation to a practice of such infinite variety, and that in view of the great problems which environ the science of medicine, some vivisection must continue. For many reasons, I am glad to support the measure now under your consideration. It does not impede in any way the proper use of animal experimentation. It is not an attack upon the medical profession to which I have the honor to belong. Its one aim is to bring the practice out of the obscurity in which it is concealed to-day, to place it in the hands of proper individuals, and to put it under legal regulation and the supervision of the State.

Let us look somewhat closely at this bill. Is it either a true or fair statement to assert that this measure is in opposition to scientific investigations? Why, sir, we are dealing with written words that are as plain as any in the English language. In the first place, this bill permits any experiment whatever upon certain classes of living animals when such experiment can be begun and completed without the causation of pain. This is a very broad permission, Mr. Chairman. It is asserted by physiologists that the vast majority of experiments for

teaching purposes may be wholly without pain by the use of anæsthetics; and if this statement is accurate, we have a large class of vivisections, perhaps a majority of vivisections, which this bill does not prohibit, and seeks only to keep in proper hands. In the second place, this measure does not prohibit inoculation experiments and what are known as bacteriological investigations, even where this class of experiments involve the causation of a certain degree of pain. Think for a moment what this means. All those varied investigations of science which have resulted in the discovery of the antitoxins, all experiments concerning diphtheria, tetanus, consumption, and other germ diseases, are, so far as I can perceive, unaffected by the provisions of this bill. Thirdly, we come to experiments upon living animals, where certain surgical operations are made in order that their utility or uselessness may be first demonstrated before trying them upon man.

Such experiments as these may be made under anæsthetics, but the pain of healing must often be severe, as severe certainly as a man would suffer under like circumstances; and yet it is permitted by this bill. Fourthly, we have here no hindrance to whatever tests of drugs or medicines physicians or chemists may desire to make. I confess, sir, that to me this bill seems to go to the farthest extreme of concession in the anxiety of its framers to yield to the wishes of scientific men so far as may be consistent with the principle of legal supervision. Why, it concedes everything of utility. It asks only that the law shall be above the individual; that abuse and wanton cruelty shall be impossible except as a crime; that the methods and results of all experiments shall be officially made known, and that the privileges of experimentation shall be given only to trained and qualified men.

We are told, Mr. Chairman, that there is no necessity for such a measure as this. That depends upon whether vivisection is capable of abuse. I confess that from those who oppose legislation of any kind I have never heard one word in condemnation of the awful atrocities that have stained the practice of vivisection. But it seems to be a law of nature, that wherever you find unlimited power you find in due time that power abused; and no facts of history are more capable of verification than the unspeakable cruelties practiced in vivisection by eminent men in countries where the practice is not controlled by law. Why, both in Europe and America, I have personally seen torment, exquisite and prolonged, inflicted upon living animals, not for any purpose of beneficent discovery, but solely to demonstrate, over and over, facts as well known as the alphabet. Not long since one of the leading vivisector professors in a New York medical college told me of most sickening experiments performed by one of his associates in the laboratory to which he belonged. Yet nothing could be done—the law does not penetrate there. We are becoming a byword, even among physiologists, for our indifference. Dr. Gerald Yeo, the professor of physiology in King's College, London, in an article of the Fortnightly Review, protested against English physiologists being held responsible for the cruelties of other lands. "Why repeat," he says, "the oft-told tale of horrors contained in the works of Claude Bernard, Paul Bert, Brown-Sequard, and Richet in France, of Goltz in Germany, Mantagazza in Italy, and Flint in America?"—coupling thus the name of an American physiologist with the names of some of the most inhuman and brutal vivisectors that ever walked the earth. Some five years ago, in this city of Washington, Prof. Theophilus Parvin, M. D., of Jefferson Medical College, Philadelphia, delivered the presidential address before the American Academy of Medicine; and, calling attention to the subject of vivisection, he asserted that there were

investigators "who seem, seeking useless knowledge, to be blind to the writhing agony, and deaf to the cry of pain of their victims, and who have been guilty of the most damnable cruelties without the denunciation of the public and of the profession that their wickedness deserves and demands. These criminals are not confined to Germany or France, to England or Italy, but may be found in our own country." "Criminals" and "damnable cruelties" are strong words, Mr. Chairman, to be used by the president of the Academy of Medicine in regard to American physicians or the practice of vivisection in American laboratories.

Take another expression of opinion. In his recent work on "The Meaning and Method of Life," Dr. George M. Gould, late editor of the Medical News and a strong advocate of vivisection, by the way, declares that it "must be regulated by law." * * * "The practice carried on by conceited jackanapes to prove over and over again already ascertained results, to minister to egotism for didactic purposes—these are not necessary and must be forbidden." Well, that is what we are asking by this bill, that qualified men and not "conceited jackanapes" shall have the right to vivisect. Sometimes it is asserted that no unnecessary pain is ever inflicted. Talking on this subject with a professional physiologist, he told me that on one occasion he was in a laboratory when the professor desired a bit of animal intestine to use in one of his experiments. It would have been easy to have had an assistant kill a rabbit by knocking it first on the head, but that would have occupied half a minute's time. "Give me a rabbit," he called to the assistant, and, taking in his grasp the struggling creature, he plunged the blade of a pair of scissors in the abdomen, cut it open as one would cut a piece of cloth, thrust in his hand, tore out the entrails, cut off what he wanted, and flung the writhing and mutilated creature under the table to die in agony. That is what comes from unrestricted vivisection, and that cruelty is possible in any laboratory in Washington to-day; so far as any law is concerned that alone could make it a crime. When Dr. Klein, of London, was asked by the royal commission in regard to his use of anæsthetics he admitted that he used them only for personal convenience, that he had "no regard at all" for the suffering of the animals, "no time, so to speak, for thinking what the animal will feel or suffer." Why, sir, there is no ingenuity of torment, no method of agony that has not been employed wherever vivisection is wholly unrestricted by law or public sentiment—not for the benign purpose of discovering some new means of ameliorating human misery, but solely to gratify an atrocious lust, an inhuman curiosity.

And now let us consider the objections to this bill. It is said that no cruelty has been proven in the District of Columbia; that here there are no abuses. Sir, the absence of any legal restrictions in regard to this practice is of itself a grave abuse. To close the doors of laboratories where vivisection is going on and then to demand proof of any abuse of vivisection there is a method of argument which I do not care to characterize. "But this is an attack on the medical profession." Nonsense. With equal good reason the great insurance companies or the savings institutions of New York or Massachusetts might complain that their integrity is impugned because the State government demands at regular intervals a report of their financial administration. But laws requiring the supervision and restriction of vivisection "have stopped medical progress in Great Britain," says the Surgeon-General; "all recent discoveries have been made on the Continent where vivisection is without restraint." I should like to hear Dr. Sternberg make that statement before the British Medical Association. It is curious, too,

that he does not perceive that this method of argument has a double edge. If the very moderate degree of supervision which obtains in Great Britain has there put an end to medical advance, how about the United States where there has been absolute freedom of experimentation during the past twenty years? What new discoveries of great recognized value in the cure of disease have come out of American laboratories? Not one. But I do not admit for an instant the implied inferiority of the medical profession in Great Britain. It was my fortune some years since to spend a year in the London hospitals and a yet longer period on the Continent; and nowhere in Europe is sick and suffering humanity treated with the kindness, the sympathy, and the skill which are shown in England, Ireland, and Scotland; nowhere in Great Britain would be tolerated an hour the brutality and indifference manifested in certain hospitals of those countries where vivisection is absolutely without restraint.

But it has been suggested, Mr. Chairman, that the members of the medical profession and scientific men generally stand as a unit in opposing the principle of this bill. No statement could be further from the truth. Not long ago I had the honor to be appointed on a committee of medical men whose object was to test public sentiment in this respect. A circular was drawn up embodying various phases of opinion and sent out to the leading scientists and educators of this country, to certain representative names in Europe, and to every physician in New York and Massachusetts who had been in practice of his profession over fifteen years. Well, sir, only 18 per cent of the physicians confessed themselves in favor of absolute nonrestraint in this matter of vivisection, and no less than 61 per cent favored the principle of this bill. Let me quote a portion of what they signed:

> We believe that the common interests of humanity and science demand that vivisection, like the study of human anatomy in the dissecting room, should be brought under the direct supervision and control of the State. The practice, whether in public or in private, should be restricted by law to certain definite objects and surrounded by every possible safeguard against license and abuse.

Sir, the first signature to that statement of opinion, heading a long list of eminent physicians and medical teachers, is the name of one who stands first among those whom science venerates to day—the name of Herbert Spencer. In support of that position I read the names of physicians and surgeons of the highest prominence—men who believe in vivisection, but not in its cruelties; men whose genius and skill have been devoted for years to the relief of suffering humanity. Can you believe, sir, that if supervision and restriction of vivisection meant injury to that art to which these men have devoted their lives they would have given approval to that principle which underlies the measure we ask you to enact into law?

And, finally, Mr. Chairman, we ask for this bill your careful consideration because it is in line with the legislation, which during the last hundred years has made for the advancement of civilization. It is a strange and sad commentary upon the innate selfishness of human nature that not one forward step in the progressive development of humanity has ever been made without opposition from some whose supposed interests were in the way. It is not a century since the governmental inspection of insane asylums and private "madhouses" was first instituted against the protests of their keepers, and no worse atrocities are recorded in history than those revealed when those secret cells and dungeons were thrown open to the light of day. The State assumed the supervision of prisons and jails and swept out of exist-

ence the torture of criminals by their keepers under guise of necessary discipline and restraint. In the great coal mines of Great Britain fifty years ago women and girls, naked to the waist, and half-grown children pushed and drew in darkness and danger far beneath the surface of the earth their burdens of fuel. The law made it illegal, and women and children were taken out of the mines. The law penetrated the factories of Great Britain, found children working fourteen hours a day at their looms and weeping at their tasks; and although any interference with the privileges of manufacturers was most bitterly resented by such statesmen as Cobden and Bright, yet even against their protests the law threw about infancy and womanhood its protecting arm.

Until twenty years ago there was nothing to prevent a shipowner from loading his craft as deep as cupidity might suggest and sending it to sea, often to disappear forever from the sight of men. To-day that is forbidden, and the commonest sailor knows that his life is safer because the law has intervened in his behalf. Two years ago, while passing through the stock yards at Chicago, my attention was attracted to a pen of animals so horribly diseased that every moment of permitted life seemed almost a cruelty. "These are animals that the inspector has condemned as food," said the official who accompanied me. "Yet up to ten years ago just such animals as these were butchered without inspection and their flesh sold as food; there was nothing to prevent it." It is hardly eighty years since the first bill preventing the wanton cruelty upon domestic animals was introduced into the Parliament of Great Britain, and it was greeted with shouts of laughter and jeers of scorn. Sir, the whole history of social progress may be read on the statute books in those laws which condemn cruelty, which limit power, which restrain the strong and protect the weak. Let us add another chapter to that record of advancing civilization which this closing century shall have to its account. Let vivisection go on; but only under wise and careful restrictions, permitted only to competent and trustworthy persons, and subject to the supervision of government, to the control of law.

Appendix.

Report of the District Commissioners.

Office of the Commissioners of the District of Columbia,
Washington, March 14, 1896.

Dear Sir: The Commissioners have the honor to make the following response upon Senate bill 1552, "For the further prevention of cruelty to animals in the District of Columbia," which was referred to them at your instance for their examination and report.

They recommend that the bill be amended as follows, and favorably acted upon:

Change the title to read as follows: "A bill to regulate vivisection in the District of Columbia."

Strike out the following paragraphs: "C" and "D" of section 2; all of section 5; all of section 6 after the word "act" in line 22; all of lines 20 and 21 in section 7.

Add a new section as follows:

"Sec. 9. That the provisions of this act shall not apply to experiments or operations conducted under the authority of the heads of any Executive Department of the General Government."

They transmit herewith copies of communications on the subject of the bill received by them from Surg. Gen. George M. Sternberg, United States Army, and W. C. Woodward, M. D., health officer of the District of Columbia, to whom they submitted the bill with request for their views thereon. They also transmit herewith a copy of a

bill modified as suggested by Mr. H. B. F. Macfarland, who accepted the invitation of the Commissioners to be one of a committee composed of Surg. Gen. George M. Sternberg, the health officer, and himself, to confer upon the bill with the object of arriving at some common understanding on the subject, and advise the Commissioners of their conclusions.

Very respectfully,

JOHN W. ROSS,
President Board of Commissioners D. C.

Senator JAMES MCMILLAN,
Chairman Committee on the District of Columbia,
United States Senate.

REPORT OF THE HEALTH OFFICER OF THE DISTRICT OF COLUMBIA.

FEBRUARY 25, 1896.

GENTLEMEN: Referring to a bill for the further prevention of cruelty to animals in the District of Columbia (S. 1552), I have the honor to submit the following report:

The title of the bill is misleading, in that its true purpose is the restriction of vivisection in the District of Columbia, and it should be so entitled, as it does not in any way deal with cruelty to animals, except as such cruelty is inflicted in what is popularly known as vivisection. Should this measure become a law, the restriction of vivisection thereby would amount to almost prohibition, as, for one reason, section 2 (c and d) provides that the animals must, during the whole of the experiment, be completely under the influence of ether or chloroform, and that if the pain is likely to continue after the effect of the anæsthetic has ceased, or if serious injury has been inflicted upon the animal, it must be killed before it recovers from the effect of the anæsthetic. This would render necessary the use of ether or chloroform even if an animal is to be subjected to an hypodermic injection or to vaccination experiments, in which case the use of anæsthetic is certainly more dangerous and probably more terrifying and painful to the animal than the experiment itself. Most of the experiments in bacteriology (which includes nearly all of the vivisection done in this District) and a very large proportion of those for other purposes require that the animal shall be kept alive sometimes for weeks after the effect of the anæsthetic has passed off, in order to determine what the result would be. The requirements of paragraph (d) would, therefore, abolish all operations of this character.

The system of certificates provided for in section 2 (e) is calculated to expose to the penalties of the law persons who are entirely innocent of any intentional violation of it. The provision for such certificates is uncalled for, in that the bill does not provide for the review of such certificates by any competent authority, leaving the matter, therefore, entirely to the judgment of the operator, as it would be if he were not required to give such certificate. The provision of this paragraph, page 3, lines 10 to 24, granting especial protection to dogs, cats, horses, asses, and mules, is apparently without reason. While they are not usually used for purposes of vivisection, I am not aware that these animals are more sensitive to pain than rabbits and guinea pigs. The penalty provided in section 2, page 4, lines 3 to 10, seems entirely unnecessary, as section 1 provides a penalty for "any person performing, or taking part in performing any experiment calculated to give pain in contravention of this act."

Section 3 is a rather remarkable innovation in District law, placing, as it does, the laboratories and experimenters connected with the War Department, the Treasury Department, and the Agricultural Department under the jurisdiction of the Commissioners of the District of Columbia.

The provisions of section 4 grant to the Commissioners of the District entirely too much discretion as to the issuance of licenses. Under this section it would be possible for them to absolutely prevent experiments by any particular individual, whether an officer of the Army, Navy, or Marine-Hospital Service, and, in fact, to absolutely prevent any vivisection in this District.

The provisions of section 5 will probably deter any person from conducting any original investigations in this District, as under these provisions the Commissioners of the District of Columbia, on complaint of some one as to the alleged cruel nature of the experiment, might require a report that would lead to the premature exposure of the results sought and obtained.

Section 6, which requires the Commissioners of the District of Columbia to "appoint or authorize an agent of the Washington Humane Society" to visit places in which experiments are being conducted, is uncalled for. I am not aware that the Washington Humane Society numbers among its members a single person who is competent to judge as to the methods of performing the various operations which are included

in vivisection so as to be able to determine whether the pain inflicted is or is not warranted; nor is it likely that they will be able to secure such a person as their agent in this matter. The further authority granted to the Commissioners "to appoint such special inspectors as they may see fit, either permanently or temporarily, who may be willing to act as such inspectors gratuitously" is calculated to do harm should the Commissioners ever elect to avail themselves of the authority thus conferred. Persons who are willing to render services of this character gratuitously are usually able to render such service as is worth just what is paid for it.

Section 7 refers to an application for a certificate as in this act mentioned. I am unable to discover, however, any provision in the bill for any certificate which would require an application for it, the only certificate referred to being apparently those to be furnished by the experimenter. It is possible that the distinction between certificates and licenses has not been drawn as clearly as the makers of the bill intended.

The proposed law is not called for by conditions at present existing in this District, nor are there any conditions likely to arise demanding the enactment of such legislation as a preventive measure. As far as vivisection in the public schools is concerned, it can be easily prevented by the school authorities without special legislation, if it is ever likely to occur. Those in this District practically familiar with the methods of vivisection, and with the results which have been and are hereafter to be obtained therefrom, are, as far as I have been able to discover, uniformly of the opinion that this measure is uncalled for and calculated to do harm.

I see no reason why the Congress of the United States should be asked to give its time to the consideration of such a law in the absence of any conditions, present or prospective, that will likely be rectified by it. I therefore recommend that it be returned with an adverse report.

Very respectfully,

WM. C. WOODWARD, M. D.,
Health Officer.

HON. COMMISSIONERS DISTRICT OF COLUMBIA.

REPORT OF THE SURGEON-GENERAL OF THE UNITED STATES ARMY TO THE COMMISSIONERS OF THE DISTRICT OF COLUMBIA.

WAR DEPARTMENT, SURGEON-GENERAL'S OFFICE,
Washington, D. C., February 1, 1896.

GENTLEMEN: Owing to want of time and frequent interruptions I was not able to present my views with reference to Senate bill 1552 as fully as I desired. It seemed to me that the first thing for you to consider is whether any legislation is necessary in the District upon this subject. As stated to you, no facts have come under my observation or to my knowledge which will justify you in presenting a bill upon this subject for the action of the Congress of the United States. Certainly if any legislation is called for it ought not to restrict research work in the various pathological laboratories in this city under the direction of different branches of the Government service, over each of which there is a responsible head, whose knowledge of the experiment made and the objects in view enables him to form a better judgment with reference to experiments conducted under his general direction than could any non-expert inspector. The only justification, from my point of view, for recommending legislation of the kind proposed would be the knowledge on your part that cruel experiments are being performed in the public schools of the District (e, section 1), or that public exhibitions of "Experiments upon living animals calculated to give pain" (section 4) are being made.

I have no knowledge of any such experiments. No doubt much sensational literature will be presented for your consideration, by members of the Antivivisection Society, which has been gathered from all parts of the world. Whatever may be the value of this evidence it has no bearing upon the question of legislation in this District, unless it can be shown that similar cruelties are being practiced here, and that those engaged in experimental research do not administer anæsthetics to the domestic animals when they are subjected to the painful experiments.

You will also have presented for your consideration arguments based upon the view that animal experimentation in the past has not yielded results of importance to the human race. The extract which I read from the London Lancet shows that this argument has been abandoned by the antivivisectionists in England. It can only be honestly maintained by a very ignorant person. To present the facts in full which show the immense value of results heretofore obtained and the great promise for the future would require a volume. The scientific medicine of to-day is founded upon such experiments, which have enabled us to demonstrate the exact cause of a considerable number of infectious diseases, to point out the way of preventing these diseases, of protecting men and animals by inoculations with attenuated virus, and, in certain cases, to cure a very large proportion of those taken sick.

I beg leave to present for your consideration a few facts to offset the wild statements of the antivivisectionists, who maintain that our experiments have had no practical utility.

The result of anthrax inoculations made by Pasteur's method in France during the past twelve years was summarized by Chamberland in 1894. He reports the total number of animals inoculated during this period as 1,788,677 sheep and 200,962 cattle, and estimates the total saving, as the result of the inoculations, as 5,000,000 francs for sheep and 2,000,000 francs for cattle.

Another infectious disease in which Pasteur's method has been employed with success is rouget, or hog erysipelas. Chamberland states that as a result of the protective inoculations practiced with Pasteur's "vaccines" the mortality from this disease in France has been reduced from about 20 per cent to 1.45 per cent.

Hutyra reports that during a single year (1889) 48,637 pigs were inoculated with Pasteur's vaccines in Hungary with a loss of 0.29 per cent, while the losses upon the same farm in previous years averaged from 10 per cent to 30 per cent.

Pasteur reported in 1894 his success in conferring immunity against hydrophobia in 19 dogs inoculated in the presence of a commission appointed for the purpose as a test experiment. These animals had been rendered refractory by his method. The 19 protected animals and 19 controlled animals, obtained from the public pound without any selection, were tested at the same time. The test was made upon some of the animals of both series by inoculation with virulent material upon the surface of the brain, and upon others by allowing them to be bitten by rabid dogs, and upon still others by intravenous inoculations.

Not one of the protected animals developed hydrophobia; on the other hand three of the controlled animals out of six bitten by a mad dog developed the disease, five out of seven which received intravenous inoculation died of rabies, and five which were trephined and inoculated on the surface of the brain died of the same disease.

With reference to his first inoculations in man, Pasteur says:

"Making use of this method, I had already made 50 dogs of various races and ages immune to rabies, and had not met with a single failure, when, on the 6th of July, quite unexpectedly, three persons, residents of Alsace, presented themselves at my laboratory."

These persons were Theodore Vone, who had been bitten on the arm on July 4; Joseph Meister, age 9, bitten on the same day by the same rabid dog, and the mother of Meister, who had not been bitten. The child had been thrown by the dog and bitten upon the hand, the legs, and the thighs, in all in fourteen different places. Pasteur commenced the treatment at once and had the satisfaction of reporting to the Academy of Sciences in March of the following year (1886) that the boy remained in perfect health. Since this time Pasteur institutes for the treatment of hydrophobia have been established in all parts of the civilized world and the statistical reports published justify the belief that when the treatment is instituted at an early date after the bite, and is properly carried out, its protective value is almost absolute. At the Pasteur Institute in Paris 9,433 persons were treated during the years 1886 to 1890, inclusive. The total mortality from hydrophobia among those treated was considerably less than 1 per cent (0.61). In 1890, 416 persons were treated who had been bitten by animals proved to be rabid, and among these there was not a single death. In 1891 the number of inoculations was 1,539, with a mortality of 0.25 per cent; in 1892, 1,790, with a mortality of 0.22 per cent; in 1893, 1,648, with a mortality of 0.36 per cent; in 1894, 1,387, with a mortality of 0.50 per cent.

The most brilliant recent achievement in this field of investigation is that which has led up to the knowledge of the antitoxins, and especially of the antitoxin of diphtheria, which is now being extensively employed in the treatment of this disease with the most satisfactory results, as is shown by the following extracts from recent publications in medical journals:

"A collective investigation recently undertaken by the Deutsche Medicinische Wochenschrift for the purpose of determining the status of the antitoxin treatment in Germany yielded the following results: The report deals with 10,312 cases of diphtheria, all of which were treated between October 1, 1894, and April 1, 1895. Of this number, 5,883 were treated with antitoxine and 4,479 without it. The mortality in the former group was 9.6 per cent, while in the latter it was 14.7 per cent. Of 2,566 children, between 2 and 10 years, the fatality under the serum treatment was 4 per cent, while the death rate among the others not so treated was 15.2 per cent. Of 696 patients over 10 years of age treated with serum only 1 per cent died, the mortality among the others between these years not so treated being 3.7 per cent."

"At a recent meeting of the Paris Academy of Medicine, Monod (Médicine Moderne, 1895, No. 101, p. 783) presented statistics demonstrating the influence upon the mortality from diphtheria in France exerted by the antitoxin since its employment from November, 1894. The following figures represent the number of deaths

from diphtheria during the first six months in eight years in 108 French cities having a population of more than 20,000:

	Average.	
	1888–1894	1895.
January	469	205
February	466	187
March	499	155
April	442	160
May	417	113
June	333	84
Total	2,656	904

It will be seen from the above statement that during the first six months in the year 1895 after the introduction of the antitoxin treatment the number of deaths from diphtheria in the 108 French cities referred to was 1,552 less than the average for the preceding ten years, and we are justified in concluding that a considerable portion of this saving at least is due to this new method of treatment. Does not this justify the sacrifice of the lives of some hundreds of guinea pigs or other animals? Will those who accuse us of brutality in our efforts to save the lives of these innocents still insist that our experiments are unjustifiable, and that horses must not be used for obtaining this curative serum, or guinea pigs for testing its exact value?

I shall not further tax your time and patience, but remain,

Very respectfully, yours,

GEO. M. STERNBERG,
Surgeon-General United States Army.

The COMMISSIONERS OF THE DISTRICT OF COLUMBIA.

REPORT OF THE NATIONAL ACADEMY OF SCIENCES.

WASHINGTON, D. C., *April 24, 1896.*

SIR: I have the honor to acknowledge the receipt of a letter addressed to you by D. E. Salmon, the Chief of the Bureau of Animal Industry; J. R. Tryon, Surgeon-General United States Navy; George M. Sternberg, Surgeon-General United States Army, and Walter Wyman, Surgeon-General United States Marine-Hospital Service, asking that the National Academy of Sciences be called upon to express an opinion as to the scientific value of experiments upon the lower animals and as to the probable effect of restrictive legislation upon the advancement of biological science. The letter of these gentlemen is supplemented by an expression of your desire that the National Academy of Sciences should report or make suggestions upon the subject. In accordance with your request, I have the honor to submit to you the following report as the unanimous expression of the opinion of the National Academy of Sciences:

Biology is the science of living organisms and tissues, and must therefore advance by means of observations and experiments made upon living beings. One of its most important branches, viz, physiology, or the science which deals with all the phenomena of life, from the activity of bacteria to that of the brain cells of man, forms the foundation upon which the science and practice of medicine are built up, since a knowledge of the bodily functions in their normal state is essential for the understanding and treatment of those derangements of function which constitute disease.

The fact that the pursuit of physiology consists chiefly in the study of physical and chemical phenomena as manifested by living beings, makes it necessary that physiology should be studied by experimental methods. The physiologist, no less than the physicist and the chemist, can expect advancement of his science only as the result of carefully planned laboratory work. If this work is interfered with, medical science will continue to advance, as heretofore, by means of experiment, for no legislation can affect the position of physiology as an experimental science; but there will be this important difference, that the experimenters will be medical practitioners and the victims human beings.

That animals must suffer and die for the benefit of mankind is a law of nature, from which we can not escape if we would, and as long as man claims dominion over the brute creation, and asserts his right to kill and mutilate animals in order to obtain food and clothing, and even for purposes of amusement and adornment, it is surely unreasonable to wage a humanitarian warfare against the only kind of pain-giving practice that has for its object the relief of pain.

The death of an animal in a physiological laboratory is usually attended with less suffering than is associated with so-called natural death, for the discovery of anæsthetics has extended its beneficent influence over the lower animals as well as over the human race, and in modern laboratories anæsthetics are always employed, except when the operation involves less suffering to the animal than the administration of the anæsthetic (as in the case of inoculations), or in those instances in which the anæsthetic would interfere with the object of the experiment. The suffering incident to biological investigations is, therefore, trifling in amount, and far less than that which is associated with most other uses which man makes of the lower animals for purposes of business or pleasure.

As an offset to this trifling amount of animal suffering are to be placed incalculable benefits to the human race. From the time when Aristotle first discovered the insensibility of the brain to the time when the latest experiments in the use of antitoxin have largely robbed diphtheria of its terrors, almost every important advance in the science of medicine has been the direct or the indirect result of knowledge acquired through animal experimentation.

It is, of course, conceivable that persons whose occupations lead them to sacrifice animal life for scientific purposes may at times pay too little regard to the suffering which they inflict, but the Academy understands that even those who advocate restrictive legislation by Congress do not claim that such abuses exist in the District of Columbia, and until evidence of this sort is presented it would seem to be the part of wisdom to leave the regulation of research in the hands of the governing bodies of the institutions in which the work is going on. The men engaged in this work are actuated by motives no less humane than those which guide the persons who desire to restrict their action, while of the value of any given experiment, and the amount of suffering which it involves, they are, owing to their special training, much better able to judge. When the men to whom the Government has entrusted the care of its higher institutions of research shall show themselves incapable of administering them in the interest of science and humanity, then, and not till then, will it be necessary to invoke the authority of the National Legislature.

I have the honor to be, sir, yours, very respectfully,

WOLCOTT GIBBS,
President National Academy of Sciences.

Hon. JACOB H. GALLINGER,
Chairman of the Subcommittee, etc.

MEMORIAL ADOPTED BY THE MEDICAL SOCIETY OF THE DISTRICT OF COLUMBIA, AT A MEETING HELD ON WEDNESDAY EVENING, APRIL 22, 1896.

To the Congress of the United States:

Having been informed that an effort is being made by certain citizens of this District to secure the passage of a bill to prevent experiments upon living animals (Senate bill 1552), we respectfully submit for your consideration the following facts and arguments in opposition to this bill:

First. We do not hesitate to assert that without such experiments there could be no scientific biology and medicine would have no scientific basis. Our knowledge of physiology, of toxicology, and of the action of many important medicinal agents has been largely gained in this way. Our precise knowledge of the etiology of a considerable number of the infectious diseases has been obtained by inoculating susceptible animals with pure cultures of the various pathogenic bacteria, and could have been obtained in no other way. By such experiments the demonstration has been made of the specific pathogenic power of the anthrax bacillus, the spirillum of relapsing fever, the tubercle bacillus, the glanders bacillus, the diphtheria bacillus, the streptococcus of erysipelas and of puerperal fever, the micrococcus of pneumonia, etc. The prevention of hydrophobia by Pasteur's method, the treatment of diphtheria by the antitoxin, the production of bovine vaccine virus, and other practical applications of the knowledge already obtained would be impossible if those who are urging antivivisection legislation could have their way.

We can not stop to enumerate the various important practical benefits which surgery has derived from animal experimentation, but the experience gained in this way as regards the comparative safety of different methods of ligating arteries, of closing wounds of the intestines, etc., has resulted in great improvements in surgical technique and in the saving of numerous valuable lives.

Yet, there are those who maintain that no valuable results have been attained by experiments upon the lower animals, and the antivivisection literature, together with much sensational nonsense, contains quotations from the writings of certain physicians which appear to support this view. No doubt these quotations to a certain extent are garbled, and in their proper connection would not give such positive tes-

timony as to the ignorance of the physicians to whom they are credited; for to deny the importance and value of the results which have been obtained by experiments upon the lower animals is to give evidence of lamentable ignorance as regards the present position of the biological sciences, and especially of scientific medicine. But the argument that no results of importance have been attained, in view of the unimpeachable evidence to the contrary, is no longer given a very prominent place in anti-vivisection literature.

This seeks rather to carry on the propaganda, which had its origin in England more than twenty years ago, by exaggerated accounts of the cruelty of the experiments performed; and the susceptibilities of many well-meaning and estimable members of the community have been aroused by the harrowing details of experiments which they are led to believe are frequently repeated in biological and pathological laboratories, but which few of those who devote their lives to research work in such laboratories have ever witnessed.

Second. So far as we know, no evidence has been adduced that cruel and unnecessary experiments are being performed in this District, and, in our judgment, the proposed legislation is not only unnecessary, but would seriously interfere with the progress of scientific investigations now being carried on in the various Government laboratories in this city and in general with the advancement of scientific medicine.

Third. That physicians and others engaged in investigations having for their object the promotion of human knowledge and the prevention or mitigation of human suffering are less humane than the members of the societies which have been organized for the prevention of cruelty to animals we do not believe. To pass laws subjecting them to penalties and to espionage by persons ignorant of the nature and objects of their experiments, as is proposed, would not only seriously hamper research work in all lines of biological investigation, but would be an uncalled-for reflection upon the humanity of those members of the medical profession and others who are engaged in investigations of this nature. As a matter of fact, anæsthetics are habitually administered in experiments which involve an amount of pain worthy of consideration, but they are not considered necessary in trifling operations, such as the administration of a hypodermatic injection or the vaccination of a calf for the purpose of propagating vaccine virus.

Fourth. It is difficult to understand why these mischievous attempts should be made to secure legislation the effect of which would be to restrict scientific investigation, when there is such a broad field in other directions in which the crusade might be carried on with greater propriety. The trapping of animals for their furs is going on in all parts of the world, and the victims are held for hours, or even days, in the sharp jaws of the trap before they are finally dispatched. The huntsman leaves his uncaptured wounded game to a lingering death. If he is a humane man, he quickly kills the wounded bird or animal when captured, and it has not been thought necessary to pass laws requiring him to do so. The fisherman plays the bass or salmon with a sharp hook in its mouth for an hour or more, and no one protests, but the teacher of biology is to be prevented by act of Congress from exhibiting the circulation of blood in the blood vessels of the mesentery of a curarized frog.

The farmer, by a cutting or crushing operation, castrates his colts, calves, sheep, and pigs, and capons are made by a painful cutting operation; but no one proposes legislation requiring the use of anæsthetics in the performance of these operations. Under these circumstances the proposition to subject those engaged in scientific research work, which calls for the performance of experiments upon the lower animals, to espionage and penalties, as is proposed in the bill referred to, appears to us to be an unjust discrimination against a class of men who are entitled to the highest consideration. We therefore respectfully protest against the enactment of any such legislation.

SAMUEL C. BUSEY, M. D.,
President Medical Society, District of Columbia.

This memorial was unanimously adopted.

SAMUEL S. ADAMS, M. D.,
Recording Secretary.

PROTEST OF THE JOINT COMMISSION OF SCIENTIFIC SOCIETIES OF WASHINGTON, D. C.

DEAR SIR: In accordance with instructions from the Joint Commission of the Scientific Societies of Washington, I have the honor to invite your attention to the accompanying resolutions, unanimously adopted by the commission at a meeting held on February 19, 1896.

Respectfully,

J. STANLEY BROWN,
Secretary.

Hon. JAMES MCMILLAN.

Resolved, That the Joint Commission of the Scientific Societies of Washington, composed of the officers of the several scientific societies of the city, most earnestly opposes the legislation proposed by Senate bill 1552, entitled "A bill for the further prevention of cruelty to animals in the District of Columbia."

Resolved, That in the opinion of this commission the proposed legislation is unnecessary and would seriously interfere with the advancement of biological science in this District; that it would be especially harmful in its restriction of experiments relating to the cause, prevention, and cure of the infectious diseases of man and of the lower animals; that the researches made in this department of biological and medical science have been of immense benefit to the human race, and that, in general, our knowledge of physiology, of toxicology, and of pathology, forming the basis of scientific medicine, has been largely obtained by experiments upon living animals, and could have been obtained in no other way.

Resolved, That physicians and others who are engaged in research work having for its object the extension of human knowledge and the prevention and cure of disease are the best judges of the character of the experiments required and of the necessity for using anæsthetics, and that in our judgment they may be trusted to conduct such experiments in a humane manner, and to give anæsthetics when required to prevent pain. To subject them to penalties and to espionage, as is proposed by the bill under consideration, would, we think, be an unjust and unmerited reflection upon a class of men who are entitled to our highest consideration.

Resolved, That a copy of these resolutions be sent to each member of the Committees on the District of Columbia in the House of Representatives and Senate of the United States, and to the District Commissioners.

PROTEST OF THE ORANGE MOUNTAIN MEDICAL SOCIETY OF NEW JERSEY.

ORANGE, N. J., *March 6, 1896.*

SIR: The undersigned, your petitioners, are physicians in regular standing, practicing in Essex County, N. J., and are members of a medical society known as the Orange Mountain Medical Society.

At a stated meeting of the Orange Mountain Medical Society held on the 6th of March, 1896, it was resolved that in the judgment of this society a certain bill introduced in the Senate of the United States on January 14, 1896, entitled "A bill for the further prevention of cruelty to animals in the District of Columbia" is mischievous in character and calculated to impede scientific research and to hamper and discourage physicians in their efforts to discover the true causes of disease and ascertain the best remedies for the alleviation of human suffering.

It was further resolved that this society draw up a petition setting forth in brief what they esteem to be the more pernicious features of the aforesaid bill, and place the same in your hands, with the prayer that you give the same due and careful consideration, and with the further prayer that in case you are convinced that the passage of the said bill by the Senate of the United States shall be an ill-advised action, you will exert your influence, both as a member of the highest legislative body of the land and also as a member of the Committee on the District of Columbia, to defeat the passage of the said bill and to prevent the same from becoming a law.

It hardly seems necessary to remind you, honored sir, of the great and satisfactory advances which scientific medicine has made of recent years, since this is a fact known to all intelligent men. But it is probably not so well known that the basis of this great advance is the study of disease in the lower animals as well as in man. Scientific medicine may be said to have made a beginning in the discovery of the circulation of the blood by Harvey in 1620. This discovery was made by the "frequently looking into many and various living animals." Jenner's discovery of the vaccination against smallpox, whereby millions of human lives are annually saved and the most dreadful of diseases has well nigh been swept out of existence, was due to studying a disease which prevails among neat cattle, and so on through a long list of remarkable achievements down to our own day, when the antidotes to hydrophobia, tetanus, Asiatic cholera, diphtheria, and anthrax have been discovered and rendered available for the benefit of suffering humanity, and great progress has been made toward similar discoveries in reference to tuberculosis, erysipelas, septicœmia, and cancer.

In view of this splendid record and of the fact that it is better that many of the brute creation should be sacrificed rather than that one human life should be lost, we respectfully urge that every honorable means should be employed to defeat a bill whose passage would tend to vastly increase instead of diminish the sum total of suffering and disease among both men and animals.

Legislation such as is contemplated by the framers of the aforesaid bill would in our opinion tend to set back the progress of civilization by relegating the science and art of medicine to the superstition, ignorance, and fanaticism of the dark ages, from which it is now, after three centuries of painful toil, just freeing itself.

Your petitioners believe and teach that no animal should be needlessly or wantonly sacrificed; that the slightest unnecessary pain inflicted upon an animal is unscientific and cruel. They assert, however, that the learned gentlemen who conduct these scientific experiments are actuated by unselfish devotion to science and love of their fellow-men. These investigators are, therefore, in our opinion, the best judges of what is and what is not needless cruelty, and their work should, therefore, in our opinion, never be hampered by any supervision on the part of any nonmedical or unscientific persons.

We think that our position will appear the more reasonable when it is remembered that the sum total of animals used in scientific experimentation is insignificant when compared to the millions of living creatures daily slaughtered for human food, hunted for human pleasure, or destroyed to beautify our dwellings or afford ornaments to the dress of our most fastidious ladies.

Rather than weary you with many other reasons which might be advanced against the passage of the aforesaid bill, your petitioners prefer to rest their cause upon your well-known philanthropy, your love of fair dealing, your appreciation of the noble achievements of scientific medicine, and lastly upon the fact, proof of which can be readily furnished, that the allegations of the cruelties of vivisection are gross exaggerations and have no existence in fact.

We also believe that you, honored sir, will be pleased to receive an expression of opinion upon this matter from physicians practicing in your own county and in the State of New Jersey, many of whom are well known to you personally, and all of whom are your constituents and well-wishers.

With renewed assurances of our distinguished consideration, we remain,

Your obedient servants,

Wm. B. Graves, Jno. J. H. Love, M. Campbell, Wm. D. Robinson, Wm. H. Risk, G. M. Wend, Mifford Runyon, W. H. Holmes, J. K. Bradshaw, F. L. E. Tétreault, R. P. Francis, W. D. Garrett, D. E. English, Wm. H. White, Thomas S. P. Fisch, J. S. Brown, H. B. Whitehorne, William H. Van Greson, H. E. Matthews, Wm. Pierson, Chs. H. Bailey, Thos. W. Harvey, Geo. N. Van Wagenen, Richard C. Newton, Wm. J. Chandler.

Hon. JAMES SMITH, JR.,
United States Senator from New Jersey, Washington, D. C.

RESOLUTIONS ADOPTED BY THE AMERICAN MEDICAL ASSOCIATION.

Whereas the members of the American Medical Association recognize the fact that the development of scientific medicine has resulted largely from experiments upon the lower animals; and

Whereas anæsthetics are habitually administered to animals subjected to painful experiments; and

Whereas restrictive legislation is in our opinion unnecessary and opposed to the continued progress of medical science; and

Whereas it is an unjust reflection on the humanity of those engaged in animal experimentation to enact laws requiring them to use anæsthetics and appointing inspectors to see that they do so; and

Whereas far more unnecessary pain is constantly being inflicted upon the lower animals for sport and for gain than in biologic and pathologic laboratories; and

Whereas no evidence has been presented by those who advocate restrictive legislation showing that abuses exist in the District of Columbia; and

Whereas results of great practical importance have been obtained by experiments on the lower animals made in the Government laboratories in the District of Columbia: Therefore be it

Resolved, That the American Medical Association earnestly protests against the passage of Senate bill 1552, entitled "A bill for the further prevention of cruelty to animals in the District of Columbia," or any modification of this bill, unless it shall first be shown by an impartial investigation that cruel and unnecessary experiments are being performed in the District of Columbia, and that existing laws do not provide suitable punishment for cruelty to the domestic animals.

Resolved, That copies of these resolutions, attested by the signatures of the president of the American Medical Association and of its committee appointed to draft these resolutions, be sent to the chairman of the Committees on the District of Columbia in the House of Representatives and Senate of the United States.

BEVERLY COLE, M. D., San Francisco,
President American Medical Association.

NICHOLAS SENN, M. D., Chicago,
President-elect American Medical Association.

WM. OSLER, M. D., Baltimore.
J. MCFADDEN GASTON, M. D., Atlanta.
GEO. M. GOULD, M. D., Philadelphia.
DONALD MCLEAN, M. D., Detroit.

MAY 6, 1896.

MEMORIAL OF THE ASSOCIATION OF MILITARY SURGEONS.

PHILADELPHIA, *May 13, 1896.*

The undersigned, members of the Association of Military Surgeons of the United States, now holding its sixth annual meeting in the city of Philadelphia, respectfully join in the protest of the American Medical Association, as set forth in the accompanying resolutions adopted by that representative body of American physicians and surgeons at their recent meeting in the city of Atlanta:

Resolutions adopted by the American Medical Association, May 6, 1896:

Whereas the members of the American Medical Association recognize the fact that the development of scientific medicine has resulted largely from experiments upon the lower animals; and

Whereas anæsthetics are habitually administered to animals subjected to painful experiments; and

Whereas restrictive legislation is in our opinion unnecessary and opposed to the continued progress of medical science; and

Whereas it is an unjust reflection upon the humanity of those engaged in animal experimentation to enact laws requiring them to use anæsthetics and appointing inspectors to see that they do so; and

Whereas far more unnecessary pain is constantly being inflicted upon the lower animals for sport and for gain than in biological and pathological laboratories; and

Whereas no evidence has been presented by those who advocate restrictive legislation showing that abuses exist in the District of Columbia; and

Whereas results of great practical importance have been obtained by experiments on the lower animals made in the Government laboratories in the District of Columbia: Therefore, be it

Resolved, That the American Medical Association earnestly protests against the passage of Senate bill 1552, entitled "A bill for the further prevention of cruelty to animals in the District of Columbia," or any modification of this bill, unless it shall first be shown by an impartial investigation that cruel and unnecessary experiments are being performed in the District of Columbia, and that existing laws do not provide suitable punishment for cruelty to the domestic animals.

Among the names attached to this memorial are the following: Col. Louis Read, surgeon-general of Pennsylvania, president Association of Military Surgeons, United States; A. L. Gihon, M. D., Medical Director United States Navy (retired), president-elect Association of Military Surgeons, United States; Col. Charles H. Alden, Assistant Surgeon-General, United States Army, vice-president Association of Military Surgeons, United States; Col. Nicholas Senn, surgeon-general of Illinois, ex-president Association of Military Surgeons, United States; Gen. F. C. Thayer, surgeon-general of Maine; Gen. George A. Bowen, surgeon-general of Connecticut; Gen. John F. Fulton, surgeon-general of Minnesota; Maj. George Henderson, surgeon-general District of Columbia National Guard; Gen. F. W. Byers, surgeon-general of Wisconsin; Gen. James L. Priestley, surgeon-general of Iowa; Lieut. Col. Charles M. Woodward, surgeon-general of Michigan (retired); Lieut. Col. Leonard B. Almy, medical director Connecticut National Guard.

MEMORIAL OF THE PHILOSOPHICAL SOCIETY OF WASHINGTON.

WASHINGTON, D. C., *May 15, 1896.*

The Philosophical Society of Washington, through its committee appointed for that purpose, respectfully protest against the legislation proposed for the restriction of animal experimentation in the District of Columbia, for the following reasons:

First. No satisfactory evidence has been presented showing that abuses exist in this District calling for legislative action by the Congress of the United States.

Second. We recognize the fact that the progress of science in all departments of biological research, and especially the advancement of scientific medicine, depends upon experiments made upon living animals.

Third. We believe that those engaged in scientific investigations are the best judges of the necessity for experiments made by them, of the animals upon which such experiments should be made, of the methods to be employed, etc.

Fourth. We regard the proposed legislation not only as unnecessary and unwise, but as an unjust reflection upon the humanity of those who resort to animal experimentation for the solution of numerous and important biological problems which remain undetermined.

F. W. CLARKE, *President.*
BERNARD R. GREEN,
W. C. WINLOCK,
Secretaries.

MEMORIAL OF THE ENTOMOLOGICAL SOCIETY OF WASHINGTON.

WASHINGTON, *May 7, 1896.*

To the Honorable the Senate and House of Representatives of the United States:

The Entomological Society of Washington respectfully but most urgently protests against the proposed legislation embodied in Senate bill 1552 and in the proposed substitute bill recently presented to the Senate Committee on the District of Columbia.

The protest against the original bill, while directed against many of the provisions preserved in the proposed substitute, is based chiefly upon the ground that said bill would effectually prohibit all investigation in economic entomology into the best methods of meeting and destroying the numerous insect pests which cause so much damage to the agricultural interests of the country.

Although the insertion of the word "vertebrate" in the proposed substitute bill completely frees us in our entomological investigations from the pernicious legislation which threatens our colleagues in vertebrate zoology and medicine, we still respectfully but urgently protest against the passage of the bill upon the following grounds:

First. While not directly affected by the provisions of the bill we, as well as the rest of the community, would be indirectly affected.

Second. As scientific men, accustomed to the conditions governing scientific research work, we see provisions in said substitute which will greatly hamper specialists in vertebrate zoology and medicine in their investigations.

Third. Personal acquaintance with our colleagues and personal knowledge of the class of work they are doing and of the dangers to which they are often subjected in their experiments, convince us that the proposed legislation is uncalled for, unjust, and only calculated to bring law into contempt.

Fourth. Accepting the expression "cruel experiments" as meaning experiments upon animals in which there is an unjustifiable infliction of pain, we declare that we know of no cruel experiments which have ever been performed in the District of Columbia by any of our colleagues.

Fifth. We are firmly of the conviction that if any "cruel experiments" should be performed by any men the rebukes and contempt which such men would justly earn and receive from their own colleagues would be much more effectual in preventing a repetition of such experiments than any system of espionage, fine, or imprisonment.

Sixth. We see no difference in principle between the system of espionage proposed in the bill and a proposition to institute an inspection of the amphitheaters of hospitals during critical surgical operations or an inspection of the private sick room during professional calls by family physicians.

Seventh. We see no more necessity for passing a law that experimenters shall administer anæsthetics whenever possible than a law compelling surgeons to use anæsthetics in operations. In both fields of work occasions arise when chloroform or ether can not be used; in both fields of work the common sense of humanity would naturally lead the operator to use anæsthetics if possible, even if the question of utility were set entirely aside.

Eighth. The bill prevents the confirmation in the District of alleged scientific discoveries made elsewhere, a provision which can result only in prolonging agony and causing death in many cases.

Ninth. As zoologists, we fail to see why a cat, a disease-spreading dog, a horse, ass, or kicking mule is any more worthy of the special attention, deliberation, and consideration of the United States Congress than is the cow, hog, rabbit, or chicken.

Tenth. The reports to be made by investigators, as provided for in the bill, would lead to the premature disclosure of conclusions only half established.

Original signatures.	Have signed similar protests or memorials in other societies.
C. L. Marlatt, 1st asst. entomologist, U. S. Dept. of Agriculture, president of the Entomological Society of Washington.	Ch. Wardell Stiles, zoologist, Bureau of Animal Industry; honorary custodian Helm Collections, U. S. Nat. Mus. Foreign correspondent of the French Academy of Medicine. (Also in Biological Society.)
L. O. Howard, entomologist, U. S. Dept. of Agriculture, curator Dept. of Insects, U. S. Nat. Mus.	Sylvester D. Judd, U. S. Dept. of Agriculture. (Also in Biological Society.)
F. H. Chittenden, asst. entomologist, U. S. Dept. of Agriculture.	B. E. Fernow, chief Div. of Forestry, U. S. Dept. of Agriculture. (Also in Biological Society.)
Chas. Richards Dodge, special agent fiber investigations.	Geo. B. Sudworth, dendrologist, Div. Forestry, U. S. Dept. of Agriculture. (Also in Biological Society.)
E. A. Schwarz, investigator, Division of Entomology, U. S. Dept. of Agriculture.	Erwin F. Smith, asst. pathologist, U. S. Dept. Agriculture. (Also in Biological Society.)
Henry G. Hubbard, investigator, Divn. of Entomology, U. S. Dept. of Agriculture.	Theo. Holm, asst. pathologist, U. S. Dept. of Agriculture. (Also in Biological Society.)
Theo. Pergande, asst. entomologist, U. S. Dept. of Agriculture.	E. A. de Schweinitz, chief chemist, Biochemic Lab., Dept. of Agr.; prof. chem. and tox., med. Dept., Columbian Univ. (Also in Biological Society.)
Frank Benton, investigator, Div. of Entomology, U. S. Department of Agriculture.	Theo. Sill, prof. zool., Col. Univ.
D. W. Coquillett, investigator, Division of Entomology, U. S. Dept. of Agriculture.	
August Busck, U. S. Dept. of Agriculture.	
Alfred G. Masius, U. S. Dept. of Agriculture.	
Fred. C. Pratt, expert, Division of Entomology, U. S. Dept. of Agriculture.	
Martin L. Linell, aid, Dept. Insects, U. S. National Museum.	
Wm. H. Ashmead, investigator in U. S. Dept. of Agriculture, and custodian Hymenoptera in U. S. Natl. Museum.	

MEMORIAL OF THE PENNSYLVANIA MEDICAL SOCIETY.

Whereas Senate bill No. 1552, entitled "A bill for the further prevention of cruelty to animals in the District of Columbia," is pending in the Congress of the United States; and

Whereas we, the Medical Society of the State of Pennsylvania, are fully convinced that this restrictive legislation, should it become a law, would seriously cripple the efforts of the earnest scientific investigators of the District of Columbia (and indirectly of the United States), and would retard the progress of medical science in its beneficent efforts to alleviate suffering and diminish the ravages of disease; and

Whereas cruelty to animals is not practiced in the District of Columbia by those scientists who unselfishly and with great personal risk strive to increase our knowledge of disease and of the methods of its prevention and cure: Therefore, be it

Resolved, That the Medical Society of the State of Pennsylvania hereby urge the Pennsylvania delegation in the Congress of the United States to use all honorable means to defeat the said bill or any similar restrictive measure.

Resolved, That copies of these resolutions, attested by the secretary of the Medical Society of the State of Pennsylvania, and signed by the president, be sent to each member of the Pennsylvania delegation in Congress, and to the chairman of the Committees on the District of Columbia of the Senate of the United States and of the House of Representatives.

WM. S. FOSTER,
President of Medical Society of Pennsylvania, Pittsburg.
W. B. ATKINSON,
Secretary of Medical Society of Pennsylvania, Philadelphia.

HARRISBURG, PA., *May 19, 1896.*

MEMORIAL OF THE ASSOCIATION OF AMERICAN PHYSICIANS.

The Association of American Physicians, assembled in annual session at Washington, D. C., May 2, 1896, by unanimous vote and by the appended signatures of its officers and members, hereby records its most earnest protest against such legislation as that proposed by the bill entitled "A bill for the further prevention of cruelty to animals in the District of Columbia"—Senate bill 1552—in so far as this legislation embodies measures intended to control and restrict experimentation upon animals conducted in the Government laboratories, the medical schools, and other institutions of the higher learning in the District of Columbia. In making this protest the association begs to present to the members of Congress the following considerations:

Experimentation upon animals is an absolutely indispensable and the most important method of investigation of the properties of living organisms, and of the influences

which modify these properties. The science and the art of medicine are based upon the knowledge of the structure and the functions of living matter, and consequently in large part upon knowledge which has been obtained by experiments upon animals and which could have been gained in no other way.

The benefits to mankind of the knowledge thus acquired are of inestimable value. To mention only a few of the results obtained within recent years by animal experimentation, attention is called to the discoveries which have revolutionized surgical practice by the introduction of antiseptic methods of treatment, which have rendered infrequent the occurrence of childbed fever, which have made it possible to prevent the development of hydrophobia after the bite of rabid animals, which have furnished an efficacious method of cure of the otherwise incurable disease, myxœdema, and which, by the antitoxin treatment, have greatly lessened the fatality of diphtheria. By these and similar discoveries derived from experiments upon animals, untold thousands of human lives have been rescued which would otherwise surely have perished.

The saving of animal life itself and the consequent commercial profits resulting from knowledge gained by experiments upon animals have been enormous. The benefits derived from experiments upon animals largely go to the improvement of the public health and the prevention of infectious diseases. Their immediate value is often not recognizable by the individual, unless he has informed himself upon subjects which are in large measure of a technical nature and belong to the study of scientific experts.

It would require a volume to set forth adequately the results, beneficial to mankind and to animals, of knowledge derived from experiments on animals. The assertion of many opponents of vivisection that knowledge obtained from animal experimentation, and which could be obtained in no other way, has been of little or no benefit to mankind can be referred only to ignorance or to willful misrepresentation.

Never was there a time in which experimental medicine gave promise of results so important for the welfare of mankind as those which we may reasonably expect in the near future, and never was there so little justification as at present to hamper in any way the work of those engaged in searching by the experimental method for means of preventing and curing disease.

Obvious as are such beneficial results of animal experimentation as those specified—and many other similar instances might have been cited by way of illustration—it should be borne in mind that the full significance of the importance and of the results of experimentation upon animals for the biological and the medical sciences can be adequately appreciated only by those who possess special knowledge of these sciences, and that it is only those who are thus informed who can fully realize the injury which would be inflicted upon these sciences and upon medicine by such legislation as that contemplated in this bill. Upon this matter it is the voice of science and of medicine, which is likewise the voice of true philanthropy, which should be heard and which should control legislative action, and not that of those who, however worthy their impulses, however high their social position, however great their knowledge in other departments, do not possess that special knowledge which renders them competent to judge of the merits of this question.

The voice of science and of medicine, so far as it receives authoritative utterance, is overwhelmingly opposed to legislation of any kind which would take in any measure the direction of experimental medicine and physiology out of the hands of those who on account of their special fitness have been chosen by the authorities of our higher institutions of learning and of research to convey instruction and to conduct investigations in these departments. Unnecessary and offensive in the highest degree would it be by any system of official inspection, such as that proposed in this bill and which might readily be used as a system of outrageous espionage, or by legislation of any kind, to attempt to dictate or control how, and by whom, and for what purposes, and under what conditions, and upon what animals in the laboratories and the institutions of the higher learning experiments shall be made. The decision as to these matters should be left wholly to those in charge of these institutions, who are the ones most competent to judge of them.

Those engaged in the Government laboratories, in the medical schools and the universities of this country, in teaching and in investigations which require experimentation upon animals, can be safely intrusted with this function. To say the least, they are not less humane than are those who advocate legislation to control and restrict animal experimentation in these institutions. The assertion which has been made by anti-vivisectionists, that experimentation on animals brutalizes those who witness and practice it, is an insult, without shadow of foundation, to a class of scientific workers devoted to the investigation of problems of the highest importance to the welfare of mankind. Their efforts are to secure the desired knowledge by infliction of the least possible needless pain upon animals used for experimentation, and we do not hesitate to assert that this solicitude to avoid the infliction of unnecessary pain renders them more susceptible than the average man to actual cruelty to animals.

We have been unable to learn that there has been a single instance in which abuse has been made of the practice of animal experimentation in the Government laboratories, the medical schools, or the universities of the District of Columbia. Any legislation which proposes in any way to control, restrict, or interfere with animal experimentation in these institutions is, therefore, unnecessary, as well as offensive to those who are engaged in the scientific investigations conducted therein.

If there be any doubt as to the opposition of the great body of scientific men and of physicians to such legislation as that proposed in this bill, we beg that Congress will not take action favorable to this bill or to any similar one until sufficient time has been given for a full expression of opinion from scientific and medical associations throughout this country, for the matter is one not merely of local interest, but may concern the future progress of the biological and medical sciences, and of preventive and curative medicine throughout this country.

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NORMAN BRIDGE, M. D., Philadelphia, Pa.

MEMORIAL OF THE CHEMICAL SOCIETY OF WASHINGTON, D. C.

WASHINGTON, D. C., *May 14, 1896.*

To the Honorable the President of the United States Senate.

DEAR SIR: In view of the proposed legislation now before the Senate in the form of a bill entitled "An act for the further prevention of cruelty to animals in the District of Columbia," which, however, is practically an act to limit, and eventually stop, all experiments upon animals in the District of Columbia, the Chemical Society of Washington, including among its members a number of the most prominent chemists in the country, desires to present to the Senate of the United States a formal and positive protest against the enactment of any legislation upon the subject of vivisection.

The laws at present on the statute books of the District of Columbia, if properly carried out, will apply to all cases of cruelty to animals which exist in this District. The proposed bill is objectionable for very many reasons. The penalties prescribed for the infraction of the law are preposterous. An expert who did not happen to possess a permit from the District Commissioners for the performance of experiments upon animals might suddenly have placed in his hands material, the dangerous character of which could only be determined by an immediate experiment upon an animal. Should such a test be made without a license, though possibly the lives of hundreds of people were involved, the experimentor would be subject to an enormous fine and imprisonment for having in the interests of humanity inoculated a guinea pig or a rabbit or some other animal without a formal permit from the District Commissioners.

While the majority of the members of our society are not directly engaged in experiments in which animals are used, we know that in certain lines of work toxicology, materia medica, biochemistry, and the like animal experimentation is absolutely necessary for the advancement of knowledge.

The agitators of the proposed legislation have not been able to show a single instance of cruel experiments conducted in the District of Columbia, either in any of the laboratories or medical colleges or public schools, consequently there is no need for any law on the subject. Furthermore, Washington is becoming the center of education for the entire United States. Four large universities are located here; several more are in prospect, and the proposed legislation would hamper and eventually destroy all possibility for advanced post-graduate work in the biological sciences, and indirectly in all allied branches.

We therefore, collectively as a society, and individually as members, desire to protest strenuously against any legislation on the subject of vivisection, deeming it to be unwise, unecessary, and in direct opposition to the spirit which has for a number of years actuated the United States Government to encourage the advance of science. We hold further that such legislation would be a direct contradiction of the well-known practical results that have already been obtained by scientific investigations conducted under the Government, which have made possible the saving of many dollars' worth of property and many human lives.

Yours, very respectfully,

E. A. DE SCHWEINITZ, Ph. D., M. D.,
President Washington Chemical Society.
W. D. BIGELOW, Ph. D.,
W. G. BROWN, Ph. D.,
Vice-Presidents.
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FRED. P. DEWEY, Ph. B.,
Members of the Executive Committee.

MEMORIAL OF THE DETROIT MEDICAL AND LIBRARY ASSOCIATION.

DETROIT, MICH., *May 23, 1896.*

DEAR SIR: At a meeting of the Detroit Medical and Library Association held May 18, 1896, it was unanimously resolved, that:

Whereas the passage of the bill now pending in Congress, directed toward the abolishment of vivisection in the District of Columbia, will seriously impair the scientific experiments of the Smithsonian Institute, and the investigations of the different scientific departments of the Government, located at Washington:

Therefore this society requests that you, as the representative of our State, vote against such bill, and use such influence as you may deem proper to insure its defeat.

Dr. C. BONNING,
Dr. GUY S. KEIFER,
Dr. B. P. BRODIE,
Committee.
WILLIS S. ANDERSON,
Secretary.

Hon. JAMES MCMILLAN,
United States Senator, Washington, D. C.

MEMORIAL OF THE MEDICAL SOCIETY OF THE COUNTY OF NEW YORK.

NEW YORK, *April 27, 1896.*

At a meeting of the Medical Society of the County of New York, held on the above date, the following resolutions were offered by Dr. E. H. Grandin, and unanimously adopted:

Whereas organized movements for the abolition or serious restriction of the practice of scientific experimentation upon animals are now being made in this country; and

Whereas a bill is now before Congress, which, if passed, would seriously hamper such scientific investigation in the laboratories of the District of Columbia; and

Wheras vivisection has established many facts of benefit to the human organism when diseased; and

Whereas scientific vivisection aims simply at the determination of new facts which similarly may benefit mankind: Therefore, be it

Resolved, by the Medical Society of the County of New York, that scientific vivisection is essential to improvement in the ways and means of curing disease; and

Be it further resolved, That the Medical Society of the County of New York deprecates favorable action on the bill now pending before Congress.

EDWARD D. FISHER, M. D., *President.*

Attest:
CHAS. H. AVERY, *Secretary.*

MEMORIAL OF THE ESSEX DISTRICT MEDICAL SOCIETY OF THE STATE OF NEW JERSEY.

NEWARK, N. J., *April —, 1896.*

Resolved, That this society views with great disfavor the bill recently introduced into the United States Senate aimed against vivisection entitled "A bill for the further prevention of cruelty to animals in the District of Columbia;" and

Resolved further, That this society request our Senators, the Hon. James Smith, jr., and the Hon. William J. Sewell, to exert their influence in every honorable way to defeat the passage of the said bill.

EDWARD J. ILL, M. D., *President.*
ARCHIBALD MERCER, M. D., *Secretary.*

BOARD OF MEDICAL EXAMINERS REPRESENTING THE STATE MEDICAL SOCIETY OF THE STATE OF PENNSYLVANIA.

MEADVILLE, PA., *May 18, 1896.*

DEAR SIR: There is a bill before the Senate which aims to restrict vivisection. Those members of the medical profession who believe in progress and scientific methods of investigation are unanimously opposed to legislation tending to restrict vivisection. The men who are engaged in this work are men who have no other

object than to advance the science of medicine and surgery, and find out methods of relieving suffering. All of the modern operations on the brain, on the abdomen, on the thorax, on the kidney, on the womb, besides many others, have been first practiced on the animals, and the operations thoroughly worked out in that way before attempts were made on human beings. Surely it is better that some animals should be destroyed rather than that the first operations should be practiced on human beings. Then again, take all the discoveries of Pasteur and the new methods of treating diphtheria, besides many other diseases, and these methods of treatment, which have been so successful, would have been impossible by any other method than by experimenting upon animals. All the severe experiments on animals are done under chloroform.

I hope that you will see fit to oppose this bill in every way. It will be a severe blow to scientific investigation when vivisection is restricted in any way. Anything you may do to defeat the bill will be esteemed as a great personal favor by

Yours, truly,

W. D. HAMAKER.

Hon. M. S. QUAY, *Washington, D. C.*

LETTERS.

1729 CHESTNUT STREET, PHILADELPHIA, *February 18, 1896.*

MY DEAR SIR: I believe that I have the honor of addressing a doctor as well as a Senator. I desire particularly to call your attention to the bill now before Congress (Senate No. 1552) limiting scientific research by prohibiting vivisection excepting under such restrictions as to nullify its value.

I beg to point out especially the value of recent laboratory researches on the various antitoxines, particularly those of diphtheria, tetanus, and hydrophobia, which have resulted in distinct and immense advances in medicine; and, in addition to this, to the as yet incomplete researches in reference to typhoid fever, yellow fever, scarlet fever, and many other zymotic diseases.

In his recent paper on a study of seven thousand cases of diphtheria, Professor Welch, of Johns Hopkins, has stated distinctly that the diphtheria antitoxine, which has saved so many thousands of lives already, is the direct result of such laboratory researches largely, though not wholly, consisting of experiments upon animals.

In addition to this, the early and almost all other advances in antiseptic surgery and nearly all our knowledge of bacteriology, to which we owe such immense strides in the last few years, have come from experiments upon animals. Had this been prohibited in Europe and America, we should be in the relative darkness of fifty years ago. How great is that darkness only physicians know.

It would be peculiarly unfortunate if such a bill were to be passed by Congress for two reasons. The District of Columbia is the center of a great deal of scientific activity especially designed to investigate and prevent or cure many diseases of animals, and the poor beasts themselves will suffer immense detriment if such investigations be prohibited. The animals might well cry out to be saved from their friends if their diseases are to be left in their present unsatisfactory condition. Moreover, if Congress passes such a law, it will be used as a lever all over the country to have similar laws passed in other States.

Trusting that you will use your great influence against the passage of this bill, I have the honor to be,

Very respectfully, your obedient servant,

W. W. KEEN,
Professor of Surgery, Jefferson Medical College.

Hon. J. H. GALLINGER,
Committee on the District of Columbia,
United States Senate, Washington, D. C.

MAY 23, 1896.

DEAR SIR: Inclosed you will find resolutions passed at the last meeting of the Detroit Medical and Literary Association in reference to the antivivisection bill now pending in Congress.

I trust you will give this matter your personal attention, as it is one of great importance, not only to the medical and scientific world, but to the people who are to-day reaping the benefits of knowledge acquired by means of experimentation upon the lower animals.

Should this bill pass it will be a serious blow to the progress of medicine; and we feel that you ought to interest yourself in behalf of progress.

Yours, sincerely,

WILLIS S. ANDERSON, M. D.

Hon. JAMES MCMILLAN,
Washington, D. C.

PLATTSBURG, N. Y., *April 20, 1896.*

DEAR SIR: I understand a bill is now before your committee for the restriction of vivisection in the District of Columbia. I am familiar with the provisions of this humane measure, and ask you, for humanity's sake, to give it your unqualified support.

Very respectfully,

C. C. SCHUYLER, M. D.

Hon. JAMES MCMILLAN,
Washington, D. C.

OFFICE OF THE HUMANE SOCIETY OF MISSOURI,
FOR THE PREVENTION OF CRUELTY TO CHILDREN AND ANIMALS,
ST. LOUIS, *April 14, 1896.*

DEAR SIR: Information has reached me that there is now before both Houses of Congress a bill for the restriction of vivisection in the District of Columbia, and that the same has been referred to a subcommittee of which you are a member.

You will pardon me for addressing you upon this subject, but it is one in which I am deeply interested.

The society, of which I am superintendent, has on several occasions, by vote of its executive committee, stamped its disapproval upon vivisection as now conducted, and I therefore write you asking in the name of humanity that the bill be pushed forward and made a law.

Very respectfully, yours, JOHN H. HOLMES, *Superintendent.*

Senator JAMES MCMILLAN,
United States Senate, Washington, D.C.

ELMIRA, N. Y., *April 9, 1896.*

DEAR SIR: It will please many of your friends outside your own State if you will do what you can to promote the passage of the bill to control vivisection in the District of Columbia. And among them I count myself.

Yours, very truly, T. A. WALES.

Hon. J. H. GALLINGER, *United States Senate.*

NEW YORK, *April 9, 1896.*

DEAR SIR: I am informed that there is a bill before both Houses of Congress for the restriction of vivisection. I have read carefully the four provisions of said bill, and am fully in accord with them, and as to such experiments being tolerated in public schools, I can not conceive of any but evil results therefrom (and I have been in active practice forty-six years).

Hoping that you may see fit to use your valuable influence in support of this bill, I am, yours, very respectfully,

JAMES NEIL.

Senator J. H. GALLINGER, *Chairman.*

1421 CHESTNUT STREET, PHILADELPHIA, *March 30, 1896.*

MY DEAR SIR: I desire simply to say a word in favor of the bill for the further prevention of cruelty to animals, etc., which I understand is before your committee. I have carefully considered the bill and can not find anything in it which is not proper or an injury to science. Such a bill was before the Pennsylvania legislature

many years ago, and it had the approval of those who had previously been opposed to any legislation, but for one reason or another it failed of passage.

I do not see what objections can be fairly presented to the liberal and just bill which is in your committee's possession.

Respectfully,

THOMAS G. MORTON,
Surgeon to the Pennsylvania Hospital, etc., and Member Board Education Philadelphia, etc.

Hon. J. H. GALLINGER.

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16 HANCOCK STREET, BROOKLYN, *April 10, 1896.*

DEAR SIR: I write you in reference to the bill before you to restrict vivisection in the District of Columbia. I think the bill contains wise and wholesome provisions and should be passed. I am in favor of vivisection for scientific purposes, but not to gratify curiosity. Children are rushing to the study of biology to gratify a love of the startling and wonderful, which results in blunting the sensibilities and in smothering the finer feelings of our nature.

Very respectfully,

EDWARD W. AVERY, M. D.

Hon. J. H. GALLINGER.

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118 SOUTH SEVENTEENTH STREET, PHILADELPHIA, *March 31, 1896.*

GENTLEMEN: Will you kindly permit me to impress upon you the importance of the bill having for its object the prevention of vivisection and the exhibition of vivisected animals in the public schools.

You can not be unaware of the great cruelty already, in the name of instruction, inflicted upon the lower animals, yet, dreadful as this is, it may be as nothing in comparison to the demoralization wrought upon the plastic minds of children by familiarizing them with deliberate animal mutilation.

As we write these lines, knowing from long study what vivisection means, we can hardly realize that there are men so base or shortsighted as to want such a barbarous practice introduced into the curriculum of our noble public schools.

If we did not know into what baleful convictions and practices the habit of vivisection leads most of its victims, we would reject the report as being beyond belief.

Do not, we implore you, accept the testimony of culprits in defense of their crime, but read the inclosed circular by Canon Wilberforce, a man as distinguished in science and pedagogy as he is in theology, then act as God guides you, and save our children from the sight of this cruel infamy.

Respectfully, yours,

MATTHEW WOODS,
President of American Antivivisection Society.

Messrs. GALLINGER, MCMILLAN, AND BACON.

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218 SOUTH SIXTEENTH STREET, PHILADELPHIA, *March 31, 1896.*

DEAR SIR: I have been expressly requested to address you in favor of a bill for the further prevention of cruelty to animals in the District of Columbia.

I desire to say that I consider legal restriction of the practice of vivisection of animals to be necessary and right, and that the bill appears to me to be moderate in its requirements and not likely to interfere with medical teaching.

Very respectfully, yours,

FRANK WOODBURY.

Hon. JACOB H. GALLINGER,
Chairman of Committee of the United States Senate, Washington, D. C.

NEW YORK CITY, *April 9, 1896.*

DEAR SIR: The bill before Congress for the restriction of vivisection, of which you are chairman, I hope will meet with your approval, and that you will do all you can to report favorably.

Very respectfully, yours,

WM. G. HARTLEY, M. D.,
335 West Thirty-fourth street.

Senator J. H. GALLINGER.

150 West 128th Street, New York, *April 1, 1896.*

My Dear Sir: After coming to a realization of the unnecessary pain inflicted upon the brute creation by physiological investigators and medical professors, I consider it a duty toward suffering animals to protest against any vivisectional experiments which have not first been decided upon by a board of leading laymen, united with the leading medical men in every city. Further, no painful operation upon animals should be performed without anæsthetics; that the constant sight of pain inflicted is apt to harden even humane men and to brutalize the student. Lastly, all laboratories should be registered, and the operators licensed, and inspectors appointed to thoroughly inspect them.

Respectfully, yours,

Beverley O. Kinnear, M. D.,
University of Pennsylvania, 1870.

Hon. George Curtis,
House of Representatives, Washington, D. C.

Buffalo, N. Y., *April 9, 1896.*

Senator: I have been asked to express my opinion in regard to the bill now before Congress for the restriction of vivisection in the District of Columbia. I beg to say that I am heartily in favor of it. I have given this subject some study, and I am quite convinced that a great deal of vivisection is unnecessary and cruel. I hope a bill will pass restricting it.

Very respectfully, yours,

W. S. Tremaine, M. D.,
University of Pennsylvania, 1859.

Senator J. H. Gallinger,
United States Senate, Washington, D. C.

Binghamton, N. Y., *April 9, 1896.*

Dear Sir: I wish to state that I am decidedly in favor of the bill for restriction of vivisection.

Yours, respectfully,

Isaac D. Meacham.

Senator J. H. Gallinger.

Springfield, Mass., *April 10, 1896.*

Dear Sir: I see there is a bill now before both Houses of Congress for the restriction of vivisection in the District of Columbia, and I desire to add my earnest wish that such restriction may meet with success, for from personal knowledge I know there is daily being performed operations upon dumb animals which are not only brutal, but entirely unnecessary, and for my part I would not only restrict but would entirely abolish vivisection as utterly unnecessary and frightfully cruel, only going to demonstrate facts which have been proven thousands of times already and are known to the entire medical profession. I sincerely hope the bill will pass and thus prevent much unnecessary suffering to animals, and meet the approbation of thousands of kindly feeling men, and tend to make better men in the world and prevent much suffering to helpless animals, now entirely at the mercy of ambitious, but as well totally heartless men.

Very respectfully,

L. W. Cole, M. D.,
No. 159 State street, Springfield, Mass.

Hon. J. H. Gallinger, *Senator.*

Lockport, N. Y., *April 14, 1896.*

Dear Sir: I notice that there is a bill before your committee restricting vivisection, by putting safeguards around it, in the District of Columbia. I sincerely hope your committee will hold firmly to this bill. In the name of science, great cruelties have been inflicted upon animals, until it has become a fad in many cases. I am persuaded that many have practiced vivisection more for the purpose of getting their names in the papers than for science.

J. H. Helmer, M. D.
(A graduate in 1847.)

Hon. J. H. Gallinger.

NEW YORK, *April 10, 1896.*

DEAR SIR: I understand that a bill restricting vivisection is before the Senate. I wish to attest to the value of a bill of that kind, and hope it will pass.

Sincerely yours,

SAMUEL SEXTON, M. D.

Hon. J. H. GALLINGER, *United States Senate.*

ARLINGTON HEIGHTS, MASS., *April 9, 1896.*

MY DEAR SIR: I understand that in a few days the bill for the restriction of vivisection in the District of Columbia will come before your committee, and I trust you will think it worthy of your closest attention and consideration, and that you will urge upon Senators McMillan and Bacon the great importance to the cause of humanity and a higher civilization that the committee, as a whole, should vote for the bill.

The bill is fair and just, and no humane physician, physiologist, or scientist should attempt its defeat.

In the name of our poor, dumb, helpless fellow-creatures I respectfully ask you to aid this bill in becoming law.

I am, very truly, yours,

ALLAN MOTT-RING, M. D.

Senator J. H. GALLINGER.

WOLLASTON, MASS., *April 9, 1896.*

DEAR SIR: As there is now a bill before both Houses of Congress for the restriction of vivisection in the District of Columbia you are doubtless receiving the opinions of physicians. I would respectfully present this as my opinion: Wherever vivisection is practiced there will always be more or less "infernal inhumanity" on the part of some persons, notwithstanding the restrictions of the law. Hence in all medical schools vivisection ought to be abolished.

Very truly, yours,

EDWIN A. W. HARLOW, A. M., M. D.

Senator J. H. GALLINGER.

SPRINGFIELD, MASS., *April 10, 1896.*

DEAR SIR: The bill in the hands of your committee on restricted vivisection has my hearty approval. The Report of the American Humane Association on vivisection in America, 1895, gives the names of 400 professional men who favor vivisection, if without pain. I need not trouble you with any argument.

Your obedient servant,

A. S. MCCLEAN, M. D.

Senator J. H. GALLINGER.

FOLKLORE AND BEST THOUGHTS, CENTURY BUILDING,
Minneapolis, Minn., April 10, 1896.

MY DEAR DOCTOR AND SIR: My attention has just been called to a bill now before your committee relating to restriction of vivisection in the District of Columbia. If it becomes necessary to have such a humane measure indorsed by the people, I would gladly sign or circulate a petition in our section of the nation. I feel to say that for a Government such as should be, "of, by, and for" ourselves, that it is deplorable that the time has come when we must needs appeal to our servants—our Representatives—to pass laws of restriction over any class of inhuman humanity.

You already know how persistent I have been for four years in our great rescue work. I may also say that I am an antivaccinationist, and believe it to be one of the prolific causes of tuberculosis. My wish is that you, while your pugilistic colleague, Mr. C., is drawing his sword to smite off the ears of Spain and Tom Reed or any other brother, will succeed in your resolutions for humanity. Now, may I ask you to wire me the moment we get Fort Stanton donation. I want our papers here to be early in the race to proclaim the glad tidings. I see by this morning's Washington news that the committee have reported favorably on admitting New Mexico. Dr. Nichols informs me that the society is on the eve of getting off its kilt skirts and donning walking suit. I see our old Kennebec Journal, of Augusta, Me., gives you a modest send-off in their issue of April 6.

I mail you to-day our last Folklore, which has just arrived from the press. I wish you would send me $5 and a dozen names to whom I can mail the magazine for a year. I have had a "rocky" time of it to keep the publication afloat, and only for the kindness of Dr. Nichols, of Boston, could not have done it.

Let us hear from you.

Cordially and fraternally,

DR. W. P. ROBERTS.

Hon. J. H. GALLINGER,
United States Senator, Washington, D. C.

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217 EAST SEVENTEENTH STREET, NEW YORK, *April 11, 1896.*

DEAR SIR: I venture, unsolicited, to raise my voice in favor of the passage of the bill at present before Congress for the restriction of vivisection in the District of Columbia, for the reason that all vivisection that may be necessary for physiological experiment or demonstration can be performed under the act. The days when such experiments were considered an imperative necessity are fortunately gone by, and further I may state it as my opinion that many of them as nowadays performed are useless, perfunctory, and cruel. Particularly would I be in favor of the adoption of the third clause, which prohibits such experiments in the public schools.

Very respectfully,

DR. EDWARD FRANKEL,
Consulting Surgeon City Hospital.

Hon. J. H. GALLINGER,
United States Senator.

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180 WALNUT STREET, HOLYOKE, MASS., *April 12, 1896.*

DEAR SIR: Having received notice that the bill for the restriction of vivisection is now before both Houses, I gladly avail myself of the opportunity to express my views upon the subject.

From my knowledge of vivisection I am thoroughly opposed to it, and believe that in the majority of cases the moral harm more than overbalances any scientific gain which might accrue from it.

The provisos of the bill which relate to the licensing of experiments, the anæsthetizing of the animals, and the prohibiting of all vivisection from the public schools have my heartiest indorsement.

Yours, truly,

E. L. DRAPER, M. D.

Mr. J. H. GALLINGER.

LYNN, MASS., *April 11, 1896.*

DEAR SIR: I see that the "Bill for the restriction of vivisection in the District of Columbia" is before your committee. I desire to interest you in opposition to this bill, first, because it is conceded by the highest medical authority that "vivisection subserves no good purpose and has only theory to support it;" second, because of its baneful effects on the moral nature of the operators—the young are by nature given to thoughtless cruelty, and need repression in this direction. It is impossible to estimate the debasing effects of such practices, and when the ablest operators doubt whether any permanent benefit to science results from this inhuman practice, is it not wise to hesitate and take time to become familiar with all the facts possible before allowing this bill to become law?

In the interest of humanity, I ask you to vote against it.

Very respectfully,

E. H. HAWKS, M. D.

Senator J. H. GALLINGER.

THE NEW ENGLAND ANTIVIVISECTION SOCIETY,
Boston, Mass., April 6, 1896.

DEAR SIR: Being advised that you desire some authoritative opinions against vivisection, I take pleasure in sending to you those accompanying this letter, in the hope that they may prove useful to you and to the cause.

Very respectfully, yours,

PHILIP G. PEABODY, *President.*

Hon. J. H. GALLINGER, *Senate.*

AURORA, ILL., *March 31, 189.*

DEAR SIR: I am informed you are a member of the committee in the Senate having in charge the bill for the restriction of vivisection in the District. The Illinois society stands for total prohibition, hence can not officially indorse the bill of our Washington friends, but its secretary can appeal to you as an individual and urge your earnest support of this restrictive bill. I note by the reports of the speeches of its opponents that they have entirely misrepresented its provisions, claiming it would prevent all vivisectional experiments. If it did do this, then the Illinois society could indorse it. I have carefully studied the bill and contend that it is an excellent restrictive bill, calculated to amend the known cruelties and abuses of unrestrained vivisection. The whole question of scientific research is attracting much attention all over the world, and we are really on the eve of a mighty contest over it—a contest that few realize except those directly interested. Let me beg of you to listen to the merciful pleadings for justice to the helpless that must arise in the breast of every thoughtful individual, and thus lend your influence to stay the wanton waste of life under conditions which not only inflict great and needless cruelty, but which also harden the hearts of men to suffering both dumb and human.

Very truly, yours,

CYNTHIA FAIRCHILD ALLEN,
Secretary Illinois Antivivisection Society.

Hon. J. H. GALLINGER,
United States Senate, Washington, D. C.

APRIL 13, 1896.

DEAR SIR: I am informed that a bill for the restriction of vivisection in the District of Columbia, whose provisions I have just read, is now in the hands of your committee. Permit me to say that I earnestly hope that the bill will pass. That proper legislation is necessary to regulate the practice of vivisection I am thoroughly convinced, and believe that the bill now before Congress, if it becomes a law, will not only be in the interest of humanity, but will allow such operations on the bodies of living animals as are needful to the progress of medical and surgical science.

Respectfully, yours,

C. H. BROCKWAY.

Hon. J. H. GALLINGER.

NATIONAL LIFE INSURANCE COMPANY OF VERMONT,
Boston, April 13, 1896.

MY DEAR SIR: As you are by profession a physician, I will not waste any of your time by any arguments pro or con on the subject of vivisection. As you are of course very well aware, it is a mooted question to-day among many scientific men of the highest rank as to whether deductions made from observations gathered from vivisections are not largely unreliable, fallacious, and in many cases absolutely misleading. But let this be as it may, there should be no question as to the horrible barbarity of the process as it is generally performed in the physiological laboratory before the class and the absolute needlessness of it. There is no necessity of demonstrating every physiological or anatomical fact by repeating endlessly experiments which demonstrated certain facts perhaps decades ago, and which have been detailed in textbooks for a generation. And, as the fact usually is, these experiments are repeated before classes who are unfitted by their limited amount of scientific knowledge to be thoroughly able to appreciate the facts they are supposed to fix in their minds. The whole thing is based on false premises, and as practiced largely at present serves simply as an excuse for an instructor to perform a brilliant (?) experiment upon a defenseless animal, inflicting thereby indescribable suffering until death mercifully ends the barbarity, and the class are none the wiser after it is all over than they were before in the great majority of the cases, but infinitely more brutal and careless of life. Mankind in general are by natural instinct savage and brutal enough already, without having this put before them ad libitum, as is too often the case at our schools of medicine. I hope that you will set your face and influence sternly against any influence which may be brought to bear to defeat the bill for the restriction of vivisection, and that you will lend your great influence in favor of its passage.

With the highest respect, your obedient servant,

ISRAEL T. HUNT, M. D.

Hon. J. H. GALLINGER,
United States Senator from New Hampshire
and Chairman Subcommittee on Vivisection.

320 FIFTY-SEVENTH STREET, CHICAGO, *April 12, 1896.*

DEAR SIR: I understand that there is a bill now before Congress for the restriction of vivisection in the District of Columbia and that you are chairman of the Senate subcommittee appointed to deal with this question. I wish as a physician to express myself as favoring the passage of the bill. I believe that vivisection of animals is altogether too general and too often performed needlessly to demonstrate well-known facts, and is also very often performed without anæsthesia where anæsthesia might well be employed. I believe that witnessing painful experiments and the needless suffering of animals will tend to the injury of the finer impulses and sympathies, especially of the young, and might well be done away with in public schools. I am heartily in favor of the appointment of inspectors to see that the provisions of the proposed bill are enforced. I believe that I voice the sentiment of a large part of the medical profession upon these questions. Hoping the bill will pass and the good work continue,

Respectfully,

W. C. BOUTON, M. D.
Instructor in Neurology, Northwestern University Medical School.

Senator J. H. GALLINGER.

KINGSTON, N. Y., *April 11, 1896.*

DEAR SIR: Kindly allow me to express to your committee having in charge the bill in relation to the restriction of vivisection in the District of Columbia, my sentiments as being most decidedly in favor of its passage, and pray you to report it favorably. The sacrifice of animal life in the interests of humanity is undoubtedly right and proper, but in so doing to subject them to torture and the infliction of unnecessary pain and suffering is inhuman, cruel, and unbecoming a Christian people.

Yours, respectfully,

JESSE MYER, M. D.

Hon. J. H. GALLINGER.

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455 CLARK AVENUE, CLEVELAND, OHIO, *April 14, 1896.*

DEAR SIR: I write to you personally to urge the passage of the bill for the "Restriction of vivisection in the District of Columbia," the provisions of which are as follows:

(1) "All animals used in painful experiments must be completely anæsthetized during the whole operation." This is no more than right and just to the animal operated upon, and anæsthesia in no way militates against the success of scientific experiments.

(2) "All places where these experiments are performed must be registered, and all operators licensed." This will do away with much useless and needless experimentation by inexperienced students who merely wish to gratify a morbid curiosity and simply perform experiments that have been verified time and time again by embryonic professors throughout the country.

(3) "That no such operations be allowed in the public schools." It goes without argument to say that this is a most admirable clause; public exhibitions of vivisection only tend to foster and bring out the innate brutality and animal ferocity which lie dormant in every human being's nature.

(4) "That inspectors be appointed to enforce these provisions." A wise clause; for where no fear of detection exists there will be no obedience to the commands of the law.

I most heartily indorse any provisions tending to restrict the useless maiming and mutilation of animals for scientific or any other demonstrations.

Very respectfully, H. D. CHAMPLIN, M. D.,
Professor of Neuriatry, Cleveland University of Medicine and Surgery.

Senator J. H. GALLINGER,
United States Senate, Washington, D. C.

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510 FIFTH STREET NW.,
Washington, D. C., April 15, 1896.

Hon. J. H. GALLINGER,
United States Senate:

I have promised a lady, very much interested in the bill relating to vivisection now under consideration by your committee, to address you on the subject in a few brief words.

It was my lot for a number of years to be engaged in the microscopical division of the Army Medical Museum and I saw practiced the most inhuman and barbarous mutilations of the dumb animal under the supervisions and with the sanction of the United States officers in charge. A desired part or section of the animal would be removed, not under anæsthesia, and the poor beast would be then placed back in its cage or vessel until it suited the convenience of the operator to help himself to another portion, so long as the animal would survive these tortures. I have thus seen animals with eyes, section of brain, and other parts removed and kept in reserve for future experiments for a number of days, and all for the verification and repetitions of results obtained and published years ago.

These unnecessary horrors, practiced openly with sanction of United States medical officers, make me think that stringent laws are needed to restrict such proceedings. None should be permitted not calculated to give additional useful information, and then under perfect anæsthesia, and under the supervision of a board of competent men assigned to that duty.

Very respectfully, your obedient servant,

L. E. RAUTERBERG, M. D.

NEW YORK, *April 15, 1896.*

SIR: In support of a bill of the Humane Society restricting vivisection, I desire to say that so far as I can determine the majority of the members of the medical profession would cordially favor its provisions, if an opportunity were given them to express their views, for the reason that the progress of medical science would in no way be impeded by its enforcement should it fortunately become a law. Furthermore, the brutalizing effect on the minds of the young which cruelty of that kind invariably engenders will no longer be possible.

Especially will the prohibition of vivisection in all schools and colleges not medical receive the hearty support of physicians, as they believe that such instruction will serve no good, useful, or practical purpose to those who do not intend to enter the medical profession.

Very respectfully, your obedient servant,

CLINTON WAGNER, M. D.,
Late Professor New York Post-Graduate Medical School and the University of Vermont, Formerly Surgeon and Brevet Lieutenant-Colonel United States Army.

Hon. Senator J. H. GALLINGER.

OFFICE OF THE HUMANE SOCIETY OF MISSOURI
FOR THE PREVENTION OF CRUELTY TO CHILDREN AND ANIMALS,
St. Louis, April 14, 1896.

DEAR SIR: Information has reached me that there is now before both Houses of Congress a bill for the restriction of vivisection in the District of Columbia, and that the same has been referred to a subcommittee of which you are a member.

You will pardon me for addressing you upon this subject, but it is one in which I am deeply interested.

The society of which I am superintendent has on several occasions, by vote of its executive committee, stamped its disapproval of vivisection as now conducted, and I therefore write you asking in the name of humanity that the bill be pushed forward and made a law.

Very respectfully, yours,

JOHN H. HOLMES, *Superintendent.*

Senator J. H. GALLINGER,
United States Senate, Washington, D. C.

BOSTON, *February 6, 1896.*

DEAR SIR: Though not one of your constituents, I take the liberty of writing to you with regard to a bill for regulating vivisection, which, I suppose, will follow the course of the other medical bills and be referred to the subcommittee of which you are chairman. My reason for so doing is that everything done in the National Capitol in the way of local legislation for the District of Columbia attracts more attention all over the country than the acts of any one of the various State legislatures.

The antivivisection agitation, though vigorously conducted both in Europe and America during the past twenty years, has in nearly all cases been rendered futile

by the sound common sense of the community. In England alone, of all civilized countries, has a restrictive law been enacted, which, although it has inflicted a serious blow upon English physiology, has by no means satisfied the antivivisectionists, who are now loudly clamoring for absolute prohibition.

Indeed, there seems to be no middle ground on which a position can be safely taken. Either physicians must be left free to study and teach their art, at any necessary sacrifice of animal life, and, like the rest of the community, be held accountable under the general laws against cruelty for any abuse of their freedom, or vivisections must be absolutely prohibited. In this case, consistency would require a similar prohibition of all other practices which involve suffering to animals, for, in the words of a recent writer in Nature, "It is irrational folly to waste the energy of humanitarian feeling in a warfare against the only kind of pain-giving practice which is directed toward the mitigation of pain."

An inquiry into the actual methods of physiological research in use in the District of Columbia and elsewhere through the country will, I am sure, convince your committee that the abuse which this bill seeks to correct does not exist, and that the claim of the members of the Humane Society, to be actuated by motives more humane than those by which the medical profession is guided, is one which will not bear examination.

Although the agitators for the prohibition or restriction of vivisection are in many cases conscientious in their opposition to the practice, as a source of animal suffering, yet they fail so entirely to comprehend the subject in its wider relations that their conduct affords an admirable illustration of the way in which "conscience without common sense may (in the words of Mr. Roosevelt) lead to folly, which is but the handmaiden of crime."

Trusting that the bill in question will not get beyond your committee,

Yours, very truly,

H. P. BOWDITCH, M. D.,
Professor of Physiology, Harvard Medical School.

Hon. J. H. GALLINGER,
Washington, D. C.

HANOVER, N. H., *February 11, 1896.*

DEAR SIR: At the last annual meeting of the American Society of Naturalists, held in Philadelphia December 26–28, 1895, the undersigned was appointed by the American Society of Embryologists one of a committee to represent their interests in case legislation was initiated with the intention of preventing or restricting the freedom of animal experimentation.

As one of your constituents and as a worker in a college in which you have shown great interest, I venture to present for your consideration, as chairman of the subcommittee before whom the antivivisection bill 1552 will appear, the following:

It is our belief that any legislative restraints upon the freedom of animal experimentation would greatly hinder research and wholly prevent the proper teaching of many sciences fundamental to medicine. Such restriction would constitute a direct attack upon the freedom of learning, and would destroy an essential part of the university idea.

To prevent research and demonstration on living animals would be as fatal to progress in the biological sciences that form the foundation of the science of human anatomy, physiology, and medicine as would the prohibition of laboratory teaching and experimentation in physics and chemistry.

The right to experiment on living animals is not abused in this country now, nor is it likely to be. Such experiments are performed, with very rare exceptions, by educated, humane, and intelligent men, in whom the ambition to alleviate suffering is as great as in those well-meaning but misinformed persons who would bar the most effective way of doing so.

Those most active in the antivivisection movement are unfitted by temperament or training to understand the nature of the experiments performed or to appreciate their value in interpreting the vital processes in man.

The representations made in antivivisection publications concerning the methods, aims, and results of vivisection are absurdly exaggerated and distorted.

Very few of those who experiment on living animals have occasion to perform painful operations on highly organized animals in the full possession of their sensibilities.

Untrained persons are easily led to believe that certain experiments are very painful that in reality are performed on animals incapable of feeling pain, or such as are decapitated or chloroformed.

The persons under whose supervision operations more commonly called vivisection are performed are the most competent ones to decide when the practice is being abused, and their own sense of humanity and self-protection can be relied upon to

suppress it more effectively than untrained persons likely to be appointed for the purpose.

In our judgment no law could be framed that would properly discriminate between painful and painless operations, or between those of great and of minor importance to mankind. There is no way to discriminate between what is commonly called "vivisection" and the numerous experiments much more frequently performed upon the lower animals that not even the most sensitive antivivisectionist would look upon as harmful or painful in any way, but which may be of incalculable value to man in ways that it is rarely possible to foresee.

There is, in our opinion, no method by which wide-sweeping legislation could be effectively enforced, because there would be such a wide difference between the spirit, the letter, and the interpretation of the law.

Consistent legislation would necessitate the prohibition of the capturing, wounding, or killing of any wild animal, bird, or fish for the sake of sport.

The interest aroused in the biological sciences and the progress made during the last fifteen years in the United States has been very great, and bids fair to place our work in the near future abreast of the best that is being done abroad. Any legislation that interfered with the freedom of research would be likely to send our ablest workers to foreign universities, and would seriously interfere with future progress in those sciences.

We sincerely hope that your honored committee will, in its wisdom, recognize the very serious results that would follow the encouraging of any legislation likely to interfere with the freedom of research, or that would precipitate on our State legislators a shower of antivivisection bills more likely to work incalculable harm than to bring about the result for which they were framed.

I remain, dear sir, very truly, yours,

WILLIAM PATTEN,
Professor of Zoology and General Biology, Dartmouth College.

Hon. J. H. GALLINGER,
United States Senate, Washington, D. C.

WASHINGTON, D. C., *January 18, 1896.*

MY DEAR SENATOR: I am very much obliged to you for sending me a copy of Senate bill 1552. It is admirable. It protects both the animal and the human race and that is all that any reasonable person can ask, whether vivisectionist or antivivisectionist. I would simply suggest a new section, which I think will strike you as proper, somewhat in this form: "Medical officers of the United States Army, Navy, or Marine-Hospital Service shall be licensed under this act when the Surgeon-General of any one of these departments shall certify to the propriety and the necessity of such license being given."

The reasons for this section are very obvious. The Army has a medical school now in full operation in the District, and I think the Navy and Marine-Hospital Service have likewise something of the kind. It is scarcely consistent with the dignity of their office, commissioned as they are by the United States, that they should have to be certified to by members of the profession who know nothing about them. In fact, I am not quite sure but that it would be proper to authorize the chiefs of these Bureaus to give licenses to medical officers of their respective corps without having to go to the Commissioners at all. The chiefs of the several corps might be required to notify the Commissioners that they had given such licenses. It would be humiliating to United States medical officers to have to go to civilians to be certified to. All the States that require physicians to be licensed before being allowed to practice medicine within their limits specially except United States Army, Navy, and Marine-Hospital medical officers.

Thanking you for your kindness, I am,
Yours, sincerely,

WILLIAM A. HAMMOND.

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179 DEARBORN STREET, BUFFALO, N. Y., *April 11, 1896.*

DEAR SIR: My attention has been called to a bill before Congress relating to the restriction of vivisection in the District of Columbia.

Anything done with a purpose of securing a more humane treatment of our animal friends seems to me most commendable. May I not beg your earnest efforts in behalf of the bill? You will thus confer a favor upon,

Most sincerely,

E. E. BURNSIDE, M. D

Hon. JAMES MCMILLAN.

WEEDSPORT, N. Y., *April 9, 1896.*

DEAR SIR: As a physician and surgeon of thirty years' experience, I humbly petition that you use your influence for the bill now pending to restrict the barbarous and useless practice of vivisection in the District. The practice is brutal and brutalizing to all concerned in it. It makes brutes of those who should be kind and humane in the practice of the healing art. Humanity suffers as well as the poor animals.

Yours, for humanity,

IRA D. BROWN, M. D.

Hon. JAMES MCMILLAN.

NATICK, MASS., *April 10, 1896.*

MY DEAR SIR: Permit me to express to you the conviction that there is a widespread and growing belief that vivisection ought to be restricted, and I trust that the District of Columbia bill with reference to this subject will receive the indorsement of your committee. In thousands upon thousands of cases vivisection is practiced to gratify curiosity and to redemonstrate well-established truths. True science does not demand so much cruelty and indifference to the weak and helpless, and every reasonable check and limitation should be exacted. I believe a very large majority of the active, practicing physicians are opposed to unlimited vivisection. It is only that portion of the profession, as a whole, identified with schools and colleges and public institutions that are advocates of the present system.

Yours, very truly,

EDGAR S. DODGE, M. D.

Hon. JAMES MCMILLAN.

NEW YORK CITY, *March 30, 1896.*

MY DEAR SIR: I am informed that there is a bill before the Senate for the restriction of vivisection in the District of Columbia, and that opinions opposed to the practice of vivisection might prove of some avail in securing the passage of this law. I for one, as a practicing physician, am glad to take any and every opportunity of condemning the practice of vivisection. There may be said to be three classes of physicians and physiologists—one which believes in unlimited vivisection, a second which believes in restricted vivisection, and a third those who are utterly opposed to all vivisection. Although I enroll myself in the latter class, still from a practical point of view I should be willing to accept a restricted vivisection as a medium course in lack of anything better, and earnestly hope that your own broad feelings of humanity will induce you to listen to the plea of those who are opposed to vivisection. There is a much larger number of physicians opposed to vivisection than would at first appear, but they are silent because on the negative side, and because those on the affirmative are active and aggressive.

Trusting that you will pardon what may seem on my part as a somewhat voluntary expression of opinion, but is given solely for the purpose of aiding what I believe to be in the line of the truest humanity and for the best interests of the profession which I represent,

I am, most truly, yours,

WILLIAM J. MORTON,
Professor of Mental and Nervous Diseases in the New York Post-Graduate Medical School and Hospital.

Senator MCMILLAN.

DETROIT, MICH., *April 13, 1896.*

DEAR SENATOR MCMILLAN: I am greatly interested in the passage of the bill now before Congress to restrict vivisection in the District of Columbia. I have become somewhat familiar with the main features of the bill and believe its passage would remove the objections of humane people to vivisection as practiced for purely scientific purposes.

Very respectfully, yours,

W. X. NINDE.

NEW YORK, *April 4, 1896.*

DEAR SIR: I understand that there is a bill pending in the Senate of the United States in regard to the regulation of vivisection in the District of Columbia. I have not been presented with a copy of the bill, and I do not therefore know its requirements, but I have been requested by Mrs. Totten, of Washington, to write you an expression of my views, as a member of the medical profession, on the subject involved.

First. I think vivisection of animals ought to be regulated by law, and that only teachers of physiology or graduated physicians making experiments for the purpose of benefiting human beings by their investigations, should be allowed to practice vivisection.

Second. I think all laboratories and lecture rooms where vivisection is practiced ought to be subject to inspection, such inspection to be conducted by men of medical or scientific education who are totally unconnected with the institution where the experiments are conducted.

Third. I think vivisection should only be practiced upon animals under the influence of anæsthesia, in all cases where it is possible, and where not that a peaceful death ought to be accorded to the sufferer as soon as the experiments are ended. Humanity, through the medical profession, has, I believe, been greatly benefited by experiments on animals in the hands of experts, but I utterly deprecate any repetition of experiments on facts thoroughly well proven, or the placing of the dangerous power of torturing animals in the hands of any but experts of the highest character.

Yours, respectfully,

D. B. ST. JOHN ROOSA.

Hon. Senator MCMILLAN,
Senate Chamber, Washington, D. C.

List of prominent signers of the petition for the bill to regulate vivisection in the District of Columbia.

Justices John M. Harlan, H. B. Brown, David J. Brewer, E. D. White, R. W. Peckham, and George Shiras, jr., of the Supreme Court of the United States; Justices Walter S. Cox, A. B. Hagner, and C. C. Cole, of the supreme court of the District of Columbia; Chief Justice W. A. Richardson and Justices C. C. Nott and Lawrence Weldon, of the United States Court of Claims; Bishop John J. Keane, rector of the Catholic University of America; Bishop Henry Y. Satterlee, Bishop John F. Hurst, Arch Deacon Thomas S. Childs; Rev. Dr. Alexander Mackay-Smith, rector of St. Johns; Rev. Dr. Randolph H. McKim, rector of Epiphany; Rev. Dr. John H. Elliott, rector Church of the Ascension; Rev. Dr. J. A. Aspinwall, rector St. Thomas Church; Rev. Dr. Teunis S. Hamlin, pastor Church of the Covenant; Rev. Dr. Byron Sunderland, pastor First Presbyterian Church; Rev. Thomas C. Easton, pastor Eastern Presbyterian Church; Rev. Dr. Frederick D. Power, pastor Vermont Avenue Christian Church; Rev. Dr. Oliver A. Brown, pastor Foundry M. E. Church; Rev. Dr. Frank Sewall, pastor New Church; Rev. Dr. J. G. Butler, pastor Memorial Church; Rev. Dr. Alexander Kent, pastor People's Church; Gen. and Mrs. Nelson A. Miles, Mrs. U. S. Grant, Mrs. George Hearst, Mrs. John Davis, Mrs. A. W. Greely, Mrs. L. Z. Leiter, Mrs. Madeleine Vinton Dahlgren, Mrs. W. M. Stewart, Mrs. S. Powhatan Carter, Mrs. Florence Murray, Mrs. Robert Anderson, Mrs. George Shiras, jr., Mrs. H. B. Brown, Miss Emma Morton, Mrs. Henry M. Teller, Miss Olive Risley Seward, Mr. and Mrs. A. L. Barber, Mr. and Mrs. Henry F. Blount, Mrs. Benaiah J. Whitman, Gen. and Mrs. Rufus Saxton, Gen. John G. Parke, Gen. D. S. Stanley, Gen. J. S. Fullerton, Gen. H. V. Boynton, Gen. James H. Watmough, ex-Senator Charles F. Manderson, ex-Senator John B. Henderson, Representative Charles L. Henry, ex-Commissioner John W. Douglass, Mr. Crosby S. Noyes, Mr. Theodore W. Noyes, Mr. S. H. Kauffmann, Mr. John R. McLean, Mr. John Joy Edson, Mr. B. H. Warner, Mr. Charles J. Bell, Mr. Samuel M. Bryan, Mr. James E. Fitch, Mr. John B. Wight, Comptroller James H. Eckels, Mr. R. Ross Perry, Mr. Enoch Totten, Mr. W. D. Davidge, Mr. Jere M. Wilson. Mr. Mahlon Ashford, Mr. Nathaniel Wilson, Mr. Anthony Pollok, Mr. Calderon Carlisle, Mr. J. Hubley Ashton, Mr. Halbert E. Paine, Mr. Reginald Fendall, Mr. Benjamin Butterworth, Mr. Samuel Maddox, Mr. J. J. Darlington, Mr. A. G. Riddle, Mr. Henry E. Davis, Mr. Chapin Brown, Mr. H. Randall Webb, Mr. John Sidney Webb, Mr. William A. Gordon, Mr. J. Holdsworth Gordon, Mr. William Henry Dennis, Mr. Leigh Robinson, Mr. R. E. Lee, jr., Mr. Montgomery Blair, Mr. Frank T. Browning, Mr. William Stone Abert, Mr. William Redin Woodward, Mr. Story B. Ladd, Judge Thomas F. Miller, Mr. Crammond Kennedy, Mr. John Cassels, Mr. and Mrs. Charles M. Foulke, Mr. and Mrs. Horace S. Cummings, Mr. W. M. Poindexter, Mr. Maxwell Woodhull; Elliott Coues, A. M., M. D., etc., late professor of anatomy, National Medical College; Dr. F. A. Gardner; Dr. S. S. Stearns, Dr. James A. Freer, Dr. Reginald Munson, Dr. L. E. Rauterberg, Dr. S. I. Groot, Dr. Leigh Yerkes Baker, Dr. Waterman F. Corey, Dr. Charles B. Gilbert, Mr. A. S. Pratt, Mr. William B. Cabell, Maj. R. H. Montgomery, U. S. A.; Maj. Robert Craig, U. S. A.; James A. Bates, U. S. A.; David A. Irwin, U. S. A.; Theodore Mosher, U. S. A.; Frank G. Smith, U. S. A.

The bill (S. 1552) as reported:

A BILL for the further prevention of cruelty to animals in the District of Columbia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That hereafter no person shall perform on a living vertebrate animal any experiment calculated to give pain to such animal, except subject to the restrictions hereinafter prescribed. Any person performing or taking part in performing any experiment calculated to give pain in contravention of this act shall be guilty of an offense against this act, and shall, if it be the first offense, be liable to a penalty not exceeding one hundred and fifty dollars, and if it be the second or any subsequent offense, shall be liable, at the discretion of the court by which he is tried, to a penalty not exceeding three hundred dollars, or to imprisonment for a period not exceeding six months.

SEC. 2. That the following restrictions are imposed by this act with respect to the performance on any living vertebrate animal of an experiment calculated to give pain to such animal; that is to say:

(*a*) The experiment must be performed with a view to the advancement by new discovery of physiological knowledge or of knowledge which will be useful for saving or prolonging life or alleviating suffering; and

(*b*) The experiment must be performed by a person holding such license from the Commissioners of the District of Columbia as is in this act mentioned, or by a duly authorized medical officer of the Government of the United States or of the District of Columbia; and

(*c*) The animal must, during the whole of the experiment, be completely under the influence of ether or chloroform sufficiently to prevent the animal from feeling pain, excepting only that in so-called inoculation experiments or tests of drugs or medicines the animal need not be anæsthetized nor killed afterwards, nor in tests of surgical procedure need animals be kept completely anæsthetized during the process of recovery from the surgical operation. Otherwise than this the animal must be kept from pain during all experiments; and

(*d*) The animal must, if the pain is likely to continue after the effect of the anæsthetic has ceased, or if any serious injury has been inflicted on the animal, be killed before it recovers from the influence of the anæsthetic which has been administered; and

(*e*) No experiment shall be made upon any living creature, calculated to give pain to such creature, in any of the public schools of the District of Columbia, provided as follows; that is to say:

First. Experiments may be performed under the foregoing provisions as to the use of anæsthetics by a person giving illustrations of lectures in medical schools, hospitals, or colleges on such certificate being given as in this act hereafter mentioned, that the proposed experiments are absolutely necessary for the due instruction of the persons to whom such lectures are given, with a view to their acquiring physiological knowledge or knowledge which will be useful to them for saving or prolonging life or alleviating suffering;

Second. The substance known as urari or curare shall not, for the purposes of this act, be deemed to be an anæsthetic; and

Third. Notwithstanding anything in this act contained, no experiment calculated to give pain shall be performed on a dog or cat, except upon such certificate being given as in this act mentioned, stating, in addition to the statements hereinbefore required to be made in such certificate, that for reasons specified in the certificate the object of the experiment will be necessarily frustrated unless it is performed on an animal similar in constitution and habits to a cat or dog, and no other animal is available for such experiment; and an experiment calculated to give pain shall not be performed on any horse, ass, or mule, except on such certificate being given as in this act mentioned, that the object of the experiment will be necessarily frustrated unless it is performed on a horse, ass, or mule, and that no other animal is available for such purpose; and

Fourth. Any exhibition to the general public, whether admission be on payment of money or gratuitous, of experiments on living animals, calculated to give pain, shall be illegal.

Any person performing or aiding in performing such experiment shall be deemed to be guilty of an offense against this act, and shall, if it be the first offense, be liable to a penalty not exceeding one hundred and fifty dollars, and if it be the second or any subsequent offense, shall be liable, at the discretion of the court by which he is tried, to a penalty not exceeding three hundred dollars, or to imprisonment not exceeding six months; and any person publishing any notice of any such intended exhibition by advertisement in a newspaper, placard, or otherwise, shall be liable to a penalty not exceeding ten dollars.

A person punished for an offense under this section shall not for the same offense be punishable under any other section of this act.

SEC. 3. That the Commissioners of the District may insert, as a condition of granting any license, a provision in such license that the place in which any such experiment is to be performed by the licensee is to be registered in such manner as the said Commissioners may from time to time by any general or special order direct: *Provided*, That every place for the performance of experiments for the purpose of instruction shall be approved by the said Commissioners, and shall be registered in such manner as the said Commissioners may from time to time by any general or special order direct.

SEC. 4. That the Commissioners of the District, upon application as hereinafter prescribed, may license any person whom they may think qualified to hold a license to perform experiments under this act: *Provided only*, That a license shall not be granted to any person under the age of twenty-five years, unless he be a graduate from a medical college, duly authorized to practice medicine in the District of Columbia.

SEC. 5. That the Commissioners of the District may direct any person performing experiments under this act from time to time to make reports to them of the methods employed and the results of such experiments in such form and with such details as the said Commissioners may require.

SEC. 6. That the President of the United States shall cause all places where experiments on living vertebrate animals are carried on, in the District of Columbia, to be from time to time visited and inspected without previous notice for the purpose of securing compliance with the provisions of this act; and to that end shall appoint four inspectors, who shall serve without compensation, and who shall have authority to visit and inspect the places aforesaid, and who shall report to the President of the United States from time to time the results of their observations therein, which shall be made public by him.

SEC. 7. That any application for a license under this act, and for a certificate to be given as in this act mentioned, must be signed by three physicians duly licensed to practice and actually engaged in practicing medicine in the District of Columbia, and also by a professor of physiology, medicine, anatomy, medical jurisprudence, materia medica, or surgery in the medical department of any duly established reliable school or college in the District of Columbia: *Provided*, That when any person applying for a certificate under this act is himself one of the persons authorized to sign such certificate, the signature of some other of such persons shall be substituted for the signature of the applicant.

A certificate under this section may be given for such time or for such series of experiments as the persons signing the certificate may think expedient.

A copy of any certificate under this section shall be forwarded by the applicant to the Commissioners of the District, but shall not be available until one week after a copy has been so forwarded.

The Commissioners of the District may at any time disallow or suspend any certificate given under this section.

SEC. 8. That the powers conferred by this act of granting a license or giving a certificate for the performance of an experiment on living animals may be exercised by an order in writing, under the hand of any judge of a court of record having criminal jurisdiction in the District, in a case where such judge is satisfied that it is essential for the purpose of justice in a criminal case to make such experiment.

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